Journal of the Royal Society of Arts

NO. 4927 FRIDAY, 11TH JUNE, 1954 VOL. CII

ANNUAL GENERAL MEETING

The Council hereby gives notice that, in accordance with the Bye-laws, the 200th Annual General Meeting, for the purpose of receiving the Council's Report and the Financial Statements for 1953, for the election of officers and for alterations to the Bye-laws relating to the procedure for the election of the Council, will be held on Wednesday, 30th June, 1954, at 3 p.m., at the Society's House.

(By Order of the Council)

KENNETH WILLIAM LUCKHURST,
Secretary.

BICENTENARY RECEPTION

The Council announces that the revised date of the Bicentenary Reception at St. James's Palace is Wednesday, 15th December. His Royal Highness The Duke of Edinburgh, President of the Society, has graciously indicated that he will be present. Further details will be announced in due course.

BROADCAST FROM THE SOCIETY'S HOUSE

As announced in the last issue of the *Journal*, a discussion programme entitled *Serious Argument*, which is to be broadcast in the General Overseas Service of the B.B.C., will be recorded in the Society's Lecture Hall on Tuesday, 22nd June, at 8 p.m. A number of tickets in connection with this discussion are still available and Fellows are invited to apply for tickets for themselves and not more than two guests. They will be issued until all seats are allocated.

Fellows who intend to come to this meeting are also invited to submit suitable questions for the team on topics of international and domestic importance which have been in the headlines during the week before the broadcast. It is intended that those questions selected for discussion will be read by those who submit them. Questions must reach the Secretary by noon on Monday, 21st June.

ANCIENT COTTAGES IN CHIDDINGSTONE

The repair of the roofs of the ancient cottages which comprise the village of Chiddingstone, Kent, some of which are shown in the photograph, has been completed. This work was carried out by means of a grant made to the owners, the National Trust, from the Society's Fund for the Preservation of Ancient Cottages. This Fund is now exhausted.

SOIRÉE AT THE SOCIETY'S HOUSE

As announced in the last two issues of the *Journal*, an informal Reception will be held at the Society's House on the evening of Wednesday, 30th June, to provide an opportunity for Fellows to see the cinematograph film which is being made of the Bicentenary celebrations and to hear parts of the recording of the music at the Thanksgiving Service at St. Martin-in-the-Fields. The congratulatory addresses presented to the Society will again be on view, and also the large number of still photographs which were taken of the various functions. There will also, of course, be refreshments.

A few tickets are still available for this function and these will be issued in response to applications from Fellows until the supply is exhausted. Fellows are entitled to apply for tickets for themselves and one guest.

THE CHAIRMAN AND LADY RADNOR 'AT HOME'

Through the kindness of Lady Radnor it was possible to include all whose applications were received by the date notified (5th June), but no further applications can be received for tickets for the visit to Longford Castle, notices concerning which have appeared in the last two issues of the *Journal*.

GRAMOPHONE RECORDS OF THE BICENTENARY THANKSGIVING SERVICE

It will be remembered that the music rendered at the Thanksgiving Service at St. Martin-in-the-Fields on 22nd March, was provided by a choir and orchestra of staff and students of Trinity College of Music, London.

Two 12-inch gramophone records are now being prepared of part of this music from the tape recording made at the Service and containing the following items:

1. (*a*) Arne: *Trio Sonato No. 2* (last three movements).
   (*b*) Vaughan Williams: *Te Deum Laudamus.*
2. (*a*) and (*b*) Purcell: Anthem *Rejoice in the Lord.*

These records are being prepared by the British Homophone Co., and will be sold to Fellows at cost, i.e., No. 1 will cost 7*s.* 6*d.* (a royalty being payable in respect of this record) and No. 2, 6*s.* 6*d.*, postage 2*s.* extra for either one or two records. Fellows desiring to purchase either or both of these records should make early application to the Secretary as the issue will be strictly limited.

OFFER OF ENDOWED PRIZES, 1954

Offers of awards available under certain of the Society's Trusts were announced in the *Journal* on 8th January, 1954, page 95. Those interested are reminded that the closing date for entries in all cases is 31st July.

THE SOCIETY'S CHRISTMAS CARD

Arrangements are again in hand for the production of a special Christmas card for Fellows, and an early announcement of it is now made for the benefit of those resident overseas.

As this is the Society's Bicentenary year, the subject of the card will be the meeting of the eleven 'Noblemen, Clergy, Gentlemen and Merchants' at Rawthmell's Coffee House in London on 22nd March, 1754, which was the Society's first formally recorded meeting. Among those attending were Viscount Folkestone, Lord Romney, Dr. Steven Hales, Henry Baker, Gustavus Brander and James Short.

The original painting is being undertaken by Miss Anna Zinkeisen, R.O.I., R.D.I., and the cards will be reproduced in full colour, as in previous years, by the Medici Society, Ltd. It is hoped that they will be ready for issue by the first week in October, which should allow time for their despatch to and from any part of the world by Christmas.

Fellows who would like to order cards are requested to fill up the form at the back of this *Journal* and send it to the Secretary as soon as possible so that the total quantity required may be estimated.

INDUSTRIAL ART BURSARIES COMPETITIONS

1953 COMPETITION REPORT

The Report on the 1953 Industrial Art Bursaries Competition has now been published, together with the particulars of the further Competition to be held in 1954, and copies may be obtained from the Secretary without charge.

In addition to the list of awards, which was published in the *Journal* on the 19th March last, the Report also contains particulars of the Set Tests in each section, the reports and compositions of the Juries, and a summary of the uses made of Bursaries in 1953 by previous Bursary winners. Illustrations of most of the winning designs, a number of which were reproduced in the *Journal* on the 19th March last, are also included in the Report.

ARRANGEMENTS FOR 1954 COMPETITION

Details of the Competition to be held in 1954 are included in the second part of the publication. Bursaries, of £150 each in value, will be offered for the design of:

DOMESTIC ELECTRICAL APPLIANCES
ELECTRIC LIGHT FITTINGS
DOMESTIC GAS APPLIANCES
DOMESTIC SOLID-FUEL-BURNING APPLIANCES
CARPETS
DRESS TEXTILES (THREE BURSARIES OF £150 EACH)
FURNISHING FABRICS
LAMINATED PLASTICS
'PERSPEX' ARTICLES
FOOTWEAR
FURNITURE
WALL-PAPER
WOMEN'S FASHION WEAR*

Associate Membership of the Society will also be awarded, without payment of subscription, to Bursary winners under 21 years of age.

In addition to the above Bursaries the Council of the Society may provide supplementary awards from the Art Congress Studentship Trust Fund and from the Owen Jones Memorial Trust Fund.

* Details of the awards in this new section, which will be offered under the Bianca Mosca Memorial Trust, and of the special conditions attaching to them, will be published in the *Journal* as soon as they are settled. It is likely that these awards will be of more than £150 each.

MODERN DEVELOPMENTS IN RESEARCH ON FUNGICIDES

The Fernhurst Lecture by

R. W. MARSH, M.A.

Head of the Section of Plant Pathology, Long Ashton Research Station, delivered on Wednesday, 17th February, 1954, with J. Ramsbottom, O.B.E., D.Sc., M.A., F.L.S., formerly Keeper of Botany, British Museum (Natural History), in the Chair

THE CHAIRMAN: I take it that the duties which are associated with presiding at this meeting are two: one to introduce the lecturer, and the other to keep some semblance of order. I do not think there will be much difficulty over the second. With regard to the first, I hardly feel that it is necessary, but some of you, perhaps, may not know that our lecturer is one of our foremost plant pathologists. I have known him personally since he was a student at Cambridge, and previously I knew his brother, A. S. Marsh, a brilliant young botanist who was killed in France in 1916.

Mr. Marsh, after taking the course of botany at Cambridge, specialized in mycology. After leaving Cambridge he worked for a time in the herbarium at Kew, then went to Manchester University, where for three years he did mycological research for the Empire Cotton-growing Association, and then to Long Ashton, where he has been ever since. The point I should like to make is that Mr. Marsh is a mycologist; in fact, he has been president of the British Mycological Society.

In the study of disease there are always two aspects: first the aspect of the host, and secondly the aspect of the parasite. As a botanist Mr. Marsh has some knowledge of the plant host; as a mycologist, he has some knowledge of the fungal parasite with which he is dealing. The common plant diseases do not seem to affect the ordinary person. Obviously he knows that he gets mildew and black spot on his roses, but for the rest he is very much in the position that the general public were in in the 1840s during the potato famine. Even scientists then were worrying about whether the fungus—the mould and so on—was not the after effects of putrefaction rather than the cause of it. In fact, it was our eminent mycologist and phytopathologist the Rev. M. J. Berkeley who, as a result of his studies on the potato murrain, first distinguished clearly that the fungus was the cause of the putrefaction and not the putrefaction the cause of the fungus. Through the years we have used Bordeaux mixture and so on, but now controlling plant diseases has become a very highly skilled and intricate business. This lecture is concerned with fungicides. I am not a plant pathologist, far from it—I have not gone beyond the Bordeaux mixture stage—but it seems to me that a good deal of the fundamental research is absolutely dependent upon the investigations which are being carried out in the laboratories of business firms. Certainly, government laboratories cannot obtain the funds for research in chemistry and so on which are necessary. There are people like Mr. Marsh at Long Ashton who test out in the ultimate stages the efficacy of such compounds. For myself I may say that one thing that appeals to me is that we are provided with short

proprietary names rather than long organic chemistry words which I have to analyse before I have any idea what they mean, even with the aid of an organic chemistry text-book.

The following lecture, which was illustrated with lantern slides, was then delivered:

THE LECTURE

The previous lectures in this series have covered soils and fertilizers, weed-killers, plant growth regulators, and insecticides. Clearly it is logical to continue with a talk on fungicides and, although the choice of speaker is open to question, there is some justification for allotting this subject to a member of staff of the Long Ashton Research Station. At Long Ashton, work on fungicides has continued for over forty years, starting with the researches of Professor B. T. P. Barker and Mr. C. T. Gimingham in 1912. Since then, Dr. Hubert Martin and Professor Wain and, more recently, Dr. J. T. Martin and Dr. Woodcock, have been prominent in chemical studies of fungicides, Mr. Crowdy and Dr. Byrde in biological assays, and Dr. Kearns and Dr. Swarbrick in the field of spray machinery and methods of application.

The Long Ashton work has recently been reviewed[1] and it would be more appropriate to-day to concentrate on some aspects of recent developments in research on fungicides. Most of the audience will be well aware of the emergence, in the past fifteen years, of a wide range of organic fungicides including, for example, thiocarbamates, chlorinated hydrocarbons, quinones, glyoxalidines, and many new mercury compounds. These, and other materials, have been used, not only in agriculture, but in industry, in veterinary science and in medicine.

The prospects now being opened up by fungicide research are not confined to the region of materials. New methods of applying fungicides are being developed—methods of external distribution by low-volume sprays and of internal distribution by systemic action. Again, there are now novel conceptions of the way in which fungicides enter and affect fungus spores. In all this work new techniques such as chromatography and the use of radioactive tracers are playing an increasing part. Fungicide studies are indeed in a state of high activity and this activity is bringing about sweeping changes in our views on what fungicides can do and how they act.

I intend to consider only the fungicides applied to crop plants. Here the developments have not been as spectacular as for insecticides and this is readily understandable. Plants, including fungi, have some vital processes in common with insects—respiration, for instance—but their nutritional mechanism is widely different. Again, plants have no nerves. So a material like DDT that interferes with the processes of conduction of nerve impulses can be fatal to insects but harmless to plants. Between insects and plants there is a wide range of metabolic differences to be exploited.

Between green plants and fungi, on the other hand, the similarities in metabolism are much greater. Differences do exist, as demonstrated by the

fact that most plants produce starch while fungi do not: plants have cellulose cell walls while fungal cell walls are usually chitinous. There is also the anatomical difference that plants often have a protecting cuticle or bark that is lacking in fungi.

There is therefore a certain margin for selective action between plant and fungus, but it is a narrow one, and the limitations imposed by spray damage must always be taken into account in any work on fungicides intended for application to plants. Further, the value of a fungicide is often determined, not simply by the material applied, but by the residue remaining after the deposit has been subjected to many days of weathering on a plant surface. For these reasons the development of research on plant protectant fungicides cannot be confined to the laboratory or even the greenhouse: an essential part of this research still has to be done in the field.

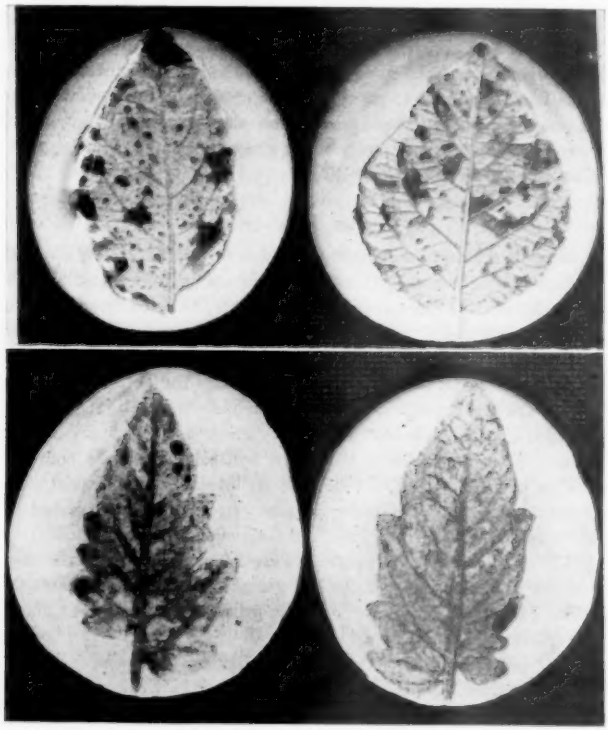
PROBLEMS OF APPLICATION

One sphere of research in fungicides which is now being explored at many different levels is the study of fungicide deposition and retention. The new factor that influences all recent work in this connection is the increasing adoption of low-volume spraying of crops. This development, with its obvious advantage in reducing the bulk of water used in conventional sprays, has shown striking success in the control of certain insect pests and in the application of hormone weedkillers. When a persistent contact insecticide such as DDT is deposited on foliage to kill an active insect, a relatively imperfect cover may be efficacious because the insect, moving over the plant, will probably make contact sooner or later with a particle of the DDT deposit. Again, the herbicide that is absorbed and translocated through the plant does not need to be distributed over the whole leaf surface. In applying protectant fungicides, the requirements are more exacting. The fungicide has little power to reach out to meet the infecting spore: neither do the spores move over the leaf surface until they encounter the spray deposit. An effective distribution of the protectant over the whole of the vulnerable surface is a necessity.

Methods of revealing patterns of spray deposit on foliage have recently been published by Large & Taylor,[2] and by J. T. Martin.[3] E. C. Large, using imprints from leaves applied to paper treated with rubeanic acid, obtained records of the deposits on potato foliage subjected to low-volume copper sprays. He thus demonstrated that when such applications were made only from above the leaf undersides received negligible deposits. J. T. Martin has described a method of pressing a leaf, or other surface carrying a spray deposit, on to a plaster-of-paris plaque before the mixture hardens. After about twenty minutes the plant material is peeled off and the spray deposit is retained undisturbed on the plaque, where it can be developed colorimetrically. This method has been applied both to copper and sulphur sprays. (See Figure 1.)

A laboratory study of the effect of fungicide distribution on the inhibition of fungus infection has been started at Long Ashton by N. G. Morgan.[4] Using the fungus *Botrytis fabae* on bean leaves, he has demonstrated that a

particle of copper spray of known weight deposited on a leaf by a micro-syringe inhibits the germination of spores in the surrounding zone provided that these are linked to the fungicide by a water bridge. A given total weight of fungicide deposit subdivided into suitably spaced particles can thus protect a much greater area of leaf than the same amount aggregated into one spot. (See Figure 2.)

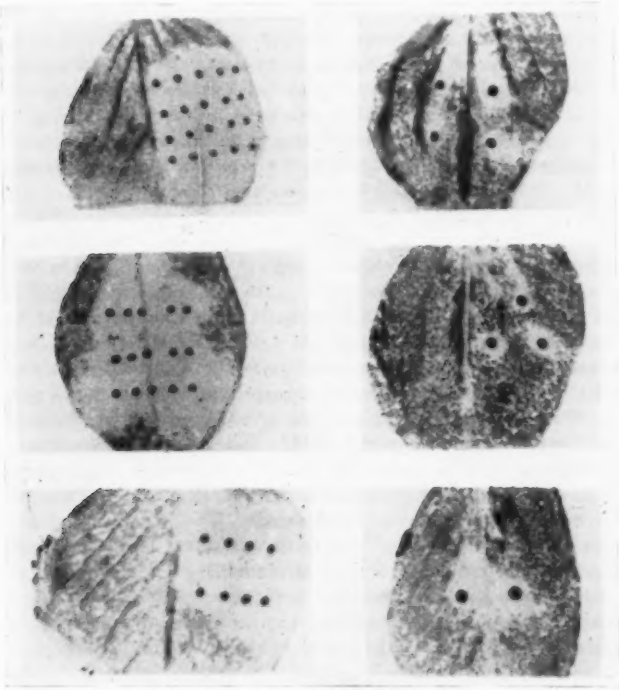


[*Reproduced by permission from* Long Ashton Annual Report, 1952

FIGURE 1. *Records on plaster-of-paris plaques.* Top: *distribution of copper oxychloride deposit on potato leaf, upper surface* (left) *and under surface* (right). Bottom: *distribution of Bordeaux mixture deposit on tomato leaf under surface: without wetter* (left); *with wetter* (right)

It has, however, been shown by G. L. McNew for dichlornaphthaquinone that there is a maximum efficiency of fungicide per unit of surface exposed. If particles of less than 3μ diameter are used the fungicidal performance is quickly reduced by oxidation, light and weathering. This size limit will obviously vary inversely with the stability of the fungicide employed.

In pursuing these investigations into the region of field control of specific diseases many difficulties are met. Thus, in exploring the performance of low-volume sprays in controlling the scab disease of apples, it is usually impossible to lay out a properly randomized trial because of spray drift effects. Consequently the low-volume applications have to be kept to the leeward side of the plot, which can seriously reduce the value of the results. In the preliminary work



[*Reproduced by permission from* Long Ashton Annual Report, 1952

FIGURE 2. *Zonal inhibition of germination of* Botrytis fabae *spores around copper deposits on bean leaf. Each leaf carries a total deposit of 0·018 mg. Cu.*

that has been done on this problem M. H. Moore,[3] at East Malling, has shown that undiluted lime sulphur suitably applied at 10 gallons an acre is non-damaging to Cox and Worcester apples; 20 gallons an acre of 50 per cent lime sulphur caused some damage; while 30 to 70 gallons an acre of 10 per cent lime sulphur caused considerable damage but gave the best scab control in trials on large trees.

H. G. H. Kearns and his colleagues at Long Ashton have started at the other end of the scale using only 1 per cent lime sulphur at 100 gallons an acre. This, in a normal spraying programme of four applications, reduced scab attack by approximately one half in 1953 but did not provide adequate control. In 1952,[6] 2 per cent lime sulphur at 200 gallons an acre reduced scab to one-sixth and 4 per cent at 100 gallons an acre reduced it to one-fifteenth compared with the unsprayed trees. The 4 per cent lime sulphur, however, caused damage and no low-volume treatment gave control equal to that provided by the conventional high-volume applications.

Further work will no doubt indicate more clearly the most satisfactory programme for low-volume spraying to deal with this disease, but it would seem likely that more applications will be necessary than are used in high-volume spraying and that the effect of the treatment will be subject to modifications by the size, shaping and spacing of the trees to which the low-volume spray is applied.

SYSTEMIC FUNGICIDAL ACTION

A new development in fungicide application is furnished by materials acting systemically. It was no earlier than 1948 that the leading Swiss phytopathologist, Ernst Gäumann, expressed the then current view by scouting the possibility of any systemic fungicidal action in plants. Within a few years the prospect had completely changed and systemic fungicidal value was being claimed for a remarkably wide range of materials. This phase was somewhat checked by the work of W. G. Keyworth, who showed that the effects of some of these materials could be paralleled by those of many treatments causing damage to roots—such as mechanical injury, hot water or hydrogen peroxide.

The present position, recently reviewed by S. H. Crowdy,[7] indicates three possible mechanisms of internal plant therapy. The first is the antidoting of toxins or enzymes produced by fungi in the vascular tissues; the second is the modification of the metabolism of the host, rendering it a less favourable environment for the pathogen; and the third is the true systemic action in which a fungitoxic compound, after being taken in by the plant and translocated through the tissues, directly depresses the growth of the fungus in the host.

Because of the many metabolic processes that higher plants and fungi have in common, it is difficult to envisage a compound that can pass harmlessly and unchanged through the cell walls and contents of a host plant and yet exert an inhibitory action against a fungus parasitizing that plant. However, such a selective action might be possible if it were dependent on products occurring only in the diseased cells. Again there may be materials capable of translocation that exert growth-regulating or enzyme-inhibiting effects on a fungus when they are at concentrations innocuous to the host.

The study of translocated materials has been facilitated by the increasing availability of radioactive tracers. For example, the radioactive isotope of sulphur has been utilized by Weed, McCallan and Miller[8], at the Boyce-Thompson Institute in investigating the systemic action of ferbam (ferric dimethyldithio-

carbamate). Tomato plants kept five days with their roots in tap water containing ferbam 'labelled' with ^{35}S showed in the shoots 1·4 to 4·6 per cent of the activity originally recorded for the ferbam in the water surrounding the roots. It is not thought that ferbam is translocated as such, since it would be unstable in the plant sap. However, the chief volatile product from ferbam is carbon disulphide and S. E. A. McCallan showed that sulphur from carbon disulphide is taken in by leaves and translocated. If 'labelled' ferbam is placed on a leaf of one tomato plant, the radioactive sulphur can be found not only in that plant but also in an adjoining plant in the same chamber, showing that sulphur is absorbed by the leaves from a volatile compound.

These results are not put forward as completely explaining the fungitoxicity of ferbam, as the carbon disulphide formed is not sufficiently toxic to account for the action of the fungicide. In parallel work on nabam (disodium ethylene-bisdithiocarbamate) it was shown that the volatile products of the fungicide contained an unidentified gas in addition to the carbon disulphide.

Another line of enquiry, linking up with the systemic control of infections in animal tissue, is the exploration of the use of antibiotics in plants. D. Pramer, working with P. W. Brian at the Butterwick laboratories, has recently published[9] the results of work on the uptake and translocation of antibiotics in cucumber seedlings. In seedlings grown with their roots in 50 p.p.m. of chloromycetin and of streptomycin these materials were taken up and translocated to the leaves, where they were identified by the use of paper chromatography. After six days the antibiotic concentration of the leaf tissue of seedlings grown in 50 p.p.m. streptomycin solution reached 90 p.p.m. No evidence was found of the translocation of three other antibiotics—aureomycin, neomycin and terramycin.

Dr. Brian and his colleagues had shown earlier that the antibiotic griseofulvin —a product of three species of *Penicillium*—had the unique property, even at 1 part in 10 millions, of inducing a characteristic distortion of the germ tubes of the fungus *Botrytis allii*. If wheat seedlings are grown in humidity chambers with their roots in culture solutions containing 2–5 parts per million of griseofulvin the seedlings develop normally and the guttation drops produced on the leaves induce, on *Botrytis allii* germ tubes, the specific effect of griseofulvin. The only probable explanation of this phenomenon is that the griseofulvin is translocated as such through the plant.

Other experiments showed that this translocation took place also in lettuce, beans and tomatoes. Systemically applied griseofulvin, used at 0·05 per cent, has been found in greenhouse trials to give control of *Alternaria solani* attack on tomato, *Botrytis fabae* on broad beans and *Botrytis cinerea* on lettuce.

Among the obstacles to the use of antibiotics as systemic fungicides are, first, their brief period of activity, usually of the order of four days. This implies the need of frequent application. Translocation has been shown to vary with atmospheric conditions, being much more rapid in the summer than in the winter. Also the margin of safety with antibiotics is often not wide. The antibiotic actidione (cycloheximide) has been used in a large number of field

spraying trials in the United States against cherry leaf spot, bean mildew and other diseases, and although it has shown high fungitoxicity it has so far proved too damaging to plants to be recommended.

To extend research on systemics it is necessary to select suitable diseases for screening trials. These are not easy to find, but testing procedures have now been established for chocolate spot of bean, for *Alternaria* leaf-spot of tomato and, in the United States, for *Fusarium* wilts of tomato and carnation.

The ultimate development, that of successful field application, still lags far behind the stage reached by the systemic insecticides. In the towns of New England, where the elm tree has a high amenity value, 8-hydroxyquinoline benzoate has been widely used in systemic applications to check Dutch elm disease, but its effect on a tree already infected is short-lived. The material is now recommended for use as a systemic preventive and is claimed to give 50 per cent control when thus applied. It is reported from the same region that *Fusarium* wilt of glasshouse carnations has been systemically controlled by soil applications of 2-benzothiazyl thioglycolate or of 4-chloro-3:5-dimethyl phenoxy ethanol. The last-named has proved moderately effective in tests at Long Ashton against chocolate spot of beans. The control of strawberry red core disease by the systemic action of nabam has been claimed, but it now seems from McCallan's work that this might be due to a fumigant action on the fungus in the soil before it enters the strawberry roots.

Present indications are that the practical applications of the use of systemic fungicides or other internal therapeutants are likely to come first on the glasshouse crops, where the volume of soil to be treated is limited and the applications and the environment can be reasonably well controlled. The extension of the principle to field crops is obviously of such potential value that it is certain to remain a major objective of fungicide research in the immediate future.

FIELD PERFORMANCE OF THE NEWER FUNGICIDES

While the systemic fungicides have not reached the stage of field employment, many of the organic fungicides used as surface protectants have now been used on field and glasshouse crops for some years. In comparing the newer fungicides with the traditional materials, Bordeaux mixture and lime sulphur, it is surprising to see what a high standard is set by these nineteenth century fungicides. Indeed it is a remarkable chance that gave us so long ago two materials exhibiting so many of the qualities desirable in a protectant spray. Both Bordeaux mixture and lime sulphur are cheap, effective against a wide range of pathogens, highly tenacious on foliage and very unlikely to injure human beings. Their disadvantages are that they are corrosive of containers and pumps, and are used at relatively higher concentrations than the organic fungicides. Bordeaux mixture is somewhat troublesome to prepare and lime sulphur is not pleasant to use. Both materials show phytotoxic effects on certain species and varieties of crop plants.

Generalizing on the subject of the organic fungicides, one can say that they are non-bulky, easy to prepare, pleasant to use, less corrosive and, broadly

speaking, less damaging. Their range of usefulness is narrower than that of lime sulphur and Bordeaux mixture, and their cost is often higher.

On apple and pear crops the requirements for new fungicides are largely bound up with the question of spray damage. In apple-growing liability to injury by lime sulphur sprays is a serious factor in the variety Lane's Prince Albert and is of some importance in Cox's Orange Pippin. In pears, the valuable Doyenné du Comice shows very marked sulphur-sensitivity. On these varieties, tetramethylthiuram disulphide, the thiocarbamate sprays, heptadecyl glyoxalidine and trichloromethylthiotetrahydrophthalimide ('captan') can be applied without risk of damage, and the last-named has in a number of trials given a higher level of scab control than the standard lime sulphur programme. The others have usually shown a satisfactory field performance but are more erratic. The thiocarbamates in particular are unstable compounds, very easily hydrolysed and liable to variations in performance arising from differences in formulation and methods of storage. In general, all these organic fungicides have the disadvantage of being costly, they do not control apple mildew, and they have no acaricidal action.

Another group of new apple sprays—phenyl mercury chloride, phenyl mercury acetate and other phenyl mercury compounds—have the advantage of being no more expensive in use than the standard lime sulphur sprays, but they also have no effect on the red spider mite and little action on mildew. Although they have a wide range of safe application they may cause damage to Cox foliage and fruit in wet seasons.

It therefore appears likely that lime sulphur spraying will continue to play a major part in English apple and pear growing. At the same time the special requirements of the sulphur-sensitive varieties can now be met by certain of the newer materials, but this will still leave one problem to be solved—the control of apple mildew. As an alternative to lime sulphur for mildew control, 2:4-dinitro-6-caprylphenyl crotonate has shown promising results in preliminary trials at East Malling, but this material is unfortunately of little value against apple scab.

On blackcurrants the leaf spot disease caused by *Pseudopeziza ribis* is readily controlled by 'captan', glyoxalidine and the thiocarbamates. However, if the disease does not become serious until July it can be adequately controlled by a post-cropping spray with Bordeaux mixture, cuprous oxide or copper oxychloride. If, however, an early attack necessitates spraying before the crop is picked, copper is undesirable because copper residues on the fruit might reach the level that would promote the breakdown of ascorbic acid in processed currants. For pre-cropping spraying, glyoxalidine has given satisfactory disease control without any adverse effect on processed fruit. The thiocarbamates are unobjectionable if the fruit is heated during processing in an open container. In the less common process of canning whole blackcurrants in syrup, thiocarbamate residues are deleterious, as they induce corrosion.

With blackcurrant, as with apples, there is consequently a large field of spraying in which the older fungicides are satisfactory, but a relatively narrow

sector in which the organic fungicides meet requirements that could not be filled by the traditional copper sprays.

Coming to the use of the newer fungicides against potato blight, there have undoubtedly been many experiments made, but few British results published. One of the most recent papers was by J. F. H. Cronshey[10] who then reported unfavourably on the field performance of thiram (tetramethylthiuram disulphide) and zineb (zinc ethylene bisdithiocarbamate). I am much indebted to Mr. Cronshey and Mr. Hainsworth for permission to give results of more recent trials, in which the zineb preparation included was a more satisfactory formulation than that used in 1951. This trial also included 'captan' and 'Manzate' (manganese ethylene bisdithiocarbamate), with cuprous oxide for comparison.

POTATO BLIGHT EXPERIMENT, 1953: VARIETY BRITISH QUEEN

Material used and concentration	Frequency of application	Date when foliage was 50 per cent dead	Prolongation of growth	Yield in lb. per plant
'Manzate' 0·14 per cent	Weekly	17 Sept.	32 days	3·1
Zineb 0·13 per cent	Weekly	15 Sept.	30 days	2·9
'Captan' 0·1 per cent	Weekly	3 Sept.	18 days	3·1
Cuprous oxide 0·25 per cent Cu	Fortnightly	3 Sept.	18 days	2·4
Control	—	16 Aug.	—	2·2

This experiment shows that both 'Manzate' and zineb will control potato blight if correctly formulated and frequently applied. Clearly they would be more attractive to the grower if they required less frequent application. A more general use of thiocarbamates on potatoes in Britain is likely to await improvements in the stability and persistence of these materials.

As well as the use of the newer fungicides as protectants there have been interesting recent developments in their use to prevent spore formation on plants already infected. The tetra- and penta-chlornitrobenzenes would probably be rejected in a screening trial of protectant fungicides, but when applied to lettuce plants they prevent the sporing of the grey mould fungus, *Botrytis cinerea*, and so check the spread of infection.

R. J. W. Byrde has shown[11] that phenyl mercury chloride, in addition to its other well-known fungicidal properties, has the ability to prevent spore formation on mummied fruits attacked by the brown rot fungi (*Sclerotinia fructigena* and *S. laxa*). Again, if it is applied to apple tree cankers caused by *Nectria galligena* it greatly reduces the sporing of the fungus. Phenyl mercury chloride at 0·3 per cent thus applied in late winter has controlled leaf scar and fruit infection in the succeeding season by stopping, at the source, the production of *Nectria* spores.

An application at this rate is uneconomic but, by the courtesy of J. R. Booer, I have been given results of a spraying trial at Tilgate where the eradicant effect of phenyl mercury chloride was tested against raspberry cane spot, caused by *Elsinoe veneta*. Here the spray applied at 0·005 per cent in March, followed by 0·0025 per cent in May, doubled the percentage of canes clear of cane spot in October—a result equal to that given by lime sulphur at 5 per cent and 2·5 per cent.

MECHANISM OF FUNGICIDAL ACTION

Many of the fungicides that have come to the fore in recent years have been revealed as a result of empirical testing of chemical compounds. At present the search for better fungicides is being increasingly directed to finding compounds able to interfere with specific aspects of fungal metabolism. It is certain that there must be a large number of fungitoxic mechanisms since no one hypothesis could explain the toxic effects produced by the diverse chemical compounds that act as fungicides. The conception that interference with one or more enzyme systems plays an inportant part is stimulating much of the present work on the mechanism of fungicidal action.

R. G. Owens, of the Boyce-Thompson Institute,[12] has been attempting to find whether enzyme-inhibiting action can act as an index to fungicidal value. He approached this problem by testing the inhibiting effect of quinones and their derivatives on pancreatic and malt amylases, using these as indicative of the types of enzyme present in fungus spores. He found that amylase inhibition was increased by chlorination of benzoquinone, 1:4-naphthaquinone and hydroquinone in a manner corresponding to their increase in fungitoxicity. However, the 1:4-naphthaquinones as a group were much more fungicidal than the corresponding benzoquinones, whereas the latter were more inhibitory towards amylases.

In other studies, he found that ferbam, ziram (zinc dimethyldithiocarbamate) and thiram were highly inhibitory to amylases and catalase while sulphur was ineffective. He concluded that chemical stability of the fungicide and permeation of the spores could profoundly modify the relation between fungitoxicity and enzyme inhibition. In other words, both chemical and physical properties contributed to fungicidal action and either might predominate dependent on the nature of the toxophore nucleus and the substituent groups in the molecule.

Owens selected pancreatic amylase as an amino-acid-dependent enzyme, and showed that its inhibition by Spergon and Phygon could be antagonized to some extent by glutathione and cysteine. A more detailed study of the antagonism of a fungicide by an amino-acid has been made by G. J. van der Kerk at the Organic Chemistry Institute in Utrecht.[13]

Van der Kerk distinguishes between two types of fungicidal action: the first in which the concentration inhibiting spore germination equals that required to suppress respiration. In this type, which includes compounds of low specificity such as salicylanilide, it is presumed that growth inhibition is due to interference with respiratory enzymes. In the second type, which is much more specific and includes thiram, growth is inhibited at concentrations much below those required

to suppress respiration. Here then it is postulated that the action of these compounds is on other than respiratory enzymes.

Using thiram as the fungicide and *Aspergillus niger* as the test fungus, van der Kerk found that the fungicide is partly antidoted on amino-acid-containing media—malt extract, peptone or casein hydrolysate, for instance. By the controlled addition of eighteen different amino-acids to a glucose-agar plate culture containing thiram and sown with *A. niger* spores, it was shown that, at pH 6·8, histidine was the only one of these amino-acids that had a major antidoting effect on the fungitoxicity of the thiram. Similarly, using *Penicillium italicum*, the addition of 2 per cent histidine to a glucose agar culture increased the minimum inhibiting concentration of thiram about five-fold. Two other amino-acids, L-cysteine and DL-methionine, showed a slight antidoting action.

It is presumed therefore that thiram (and probably tetramethylmonosulphide and the dimethyldithiocarbamates) act by interfering with the fungal synthesis of histidine or with some essential reaction for which histidine is needed. This effect does not occur when thiram is used against mycelial growth, so presumably the enzyme system interfered with has a specific function in the process of germination. The exceptional sensitiveness of certain fungus spores to thiram helps to explain its ability to act as a protectant fungicide.

Another aspect of the relationships between fungicides and fungal enzymes is the converse of that considered above. It concerns the effect of a fungal enzyme on a fungicide.

My colleague at Long Ashton, Dr. Woodcock,[11] has taken 2:3-dichlor-1:4-naphthaquinone—which is both fungitoxic and phytotoxic—and prepared from the reduced compound a diacetoxy derivative, 1:4-diacetoxy-2:3-dichlornaphthalene. This esterified compound proved harmless to plum, tomato and bean, but *in vitro* it was approximately as fungitoxic as dichlornaphthaquinone to the fungi causing plum brown-rot, chocolate spot of bean, and tomato leaf-mould. There is evidence that the ester is not inherently toxic but is converted into an effective fungicide by an esterase produced by the germinating fungus spores. As is well known, an acetylesterase is produced by insect nerve tissue, but present indications are that the fungus and the insect enzymes are not identical.

FUNGICIDE ACCUMULATION BY SPORES

One aspect of the mechanism of fungicidal action that is of special importance in the study of surface-protectant fungicides is the accumulation of the fungicide by spores. The protectant fungicides act, in general, by inhibiting the germination of the fungus spores that are deposited on a leaf surface. I have pointed out that a major handicap of the fungicides (in contradistinction to insecticides) is that they have to control a plant on a plant, which gives little opportunity of finding a selective toxicity that can be exploited. When, however, the fungicide is on a leaf cuticle and is directed against germinating spores a considerable difference in the response of these two plant structures to the fungicide might reasonably be expected.

One such response, which has now been clearly demonstrated by

S. E. A. McCallan at the Boyce-Thompson Institute[15] is in the absorptive power of the spore compared with that of the leaf. As you know, it is convenient to express concentrations of toxicants in two different ways—one used for mammals and other large organisms, the other for spores and bacteria. For mammals, toxic doses are expressed as mg. per kg. body weight; for spores, in parts per million of the solution in which the spores are placed.

The use of fungicides 'labelled' with radio-active isotopes enabled McCallan to estimate spore dosages in terms of actual concentration of fungicide per weight of spore, and his experiments demonstrated the remarkable power of fungus spores to accumulate toxicants from very dilute solutions. McCallan used labelled sulphur (in ferbam), labelled silver (in silver nitrate), carbon (in heptadecyl glyoxalidine) and cerium (in cerium sulphate). The method was, briefly, to suspend a known weight of spores in 10 ml. of the labelled fungicide solution in a centrifuge tube. To end the exposure, the spores were thrown out by centrifuging. Aliquots of the fungicidal solution were removed at intervals and radio-assayed and the results were checked by radio-assaying aliquots of the spores.

For example, 10 ml. of an aqueous solution of 2·16 p.p.m. glyoxalidine labelled with radioactive carbon gave an initial count of 494 per minute After five minutes' contact with 25 mg. of *N. sitophila* spores, the counts per minute fell to 74, that is, 85 per cent of the fungicide had been removed. In this five minutes the spores had accumulated 734 p.p.m. of the fungicide—300 times the initial concentration of the solution. Further experiments showed that most of this accumulation occurred within the first few seconds. Thus in an experiment using 10 mg. of spores 69 per cent of the fungicide was taken out of solution in 15 seconds. By repeated addition of fresh lots of solution to the same spores they were found capable of taking up more than 10,000 p.p.m. of their spore weight. Other species of fungi, including well-known pathogens such as *Venturia inaequalis*, *V. pirina* and *Monilia fructicola*, all took up 1,000–1,500 p.p.m. of their spore weight after one minute in glyoxalidine solution at 2·16 p.p.m.

The effect on germination was determined by removing the fungicidal solution after treatment and re-suspending the spores in water. Plotting the dosage-response curves using the actual weight of glyoxalidine taken up by the spores showed an E.D. 50 for *V. pirina* of 9,300 p.p.m. (See Figure 3.)

Using other fungicides, experiments with ferbam showed 50-fold accumulation by *N. sitophila*, with cerium 800-fold accumulation. Using silver in 1·04 p.p.m. solution the spores of *M. fructicola* took up as much as 2,000 p.p.m. in 30 seconds. In another series of experiments, using elemental sulphur at 2 p.p.m., spores accumulated 10,000 to 20,000 p.p.m. in a few minutes. Copper accumulation of the order of 2,000-4,000-fold has been reported by other workers using the diethyldithiocarbamate test.

The conclusion from this work is that not only innate toxicity but also the ability to be accumulated by spores plays a part in fungicidal action and that the second property may often be the more important. There is no evidence of comparable rapid accumulation by leaf surfaces and this fact may well be decisive

in determining the difference between fungicidal and phytocidal concentrations of protectant fungicides.

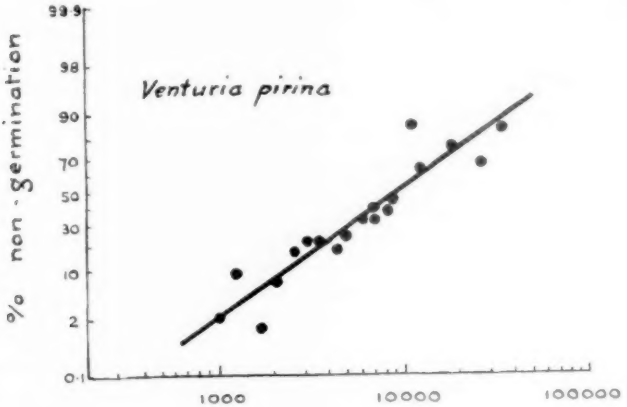


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FIGURE 3. *Dosage-response curve for the effect of 2-heptadecyl glyoxalidine, on a spore-weight basis, on* Venturia pirina

FUTURE PROSPECTS

A concluding glance at the outlook for the further use of fungicides suggests that the principal extensions in the immediate future are likely to be in the countries where agriculture is already highly developed. In such countries the horticulturists have hitherto been the principal users of fungicides, but now that the cereal farmer is becoming habituated to herbicide sprays he might also start to consider fungicide spraying. It is possible to envisage an attack on wheat rusts, for example, if the method of low-volume spraying with sulphadiazine or with calcium sulphamate fulfils the promise shown in preliminary trials.

However, taking a longer view, the major new targets for sprays lie in the tropics. In a recent symposium on insecticides and colonial agricultural development[16] several of the difficulties considered were those common to fungicides and insecticides. It was agreed that, in many countries, native agriculture is so primitive that its basic standard must be raised before pest and disease control could play any useful part. At the same time, there is in existence a widespread development of fungicide and bactericide spraying on plantation crops such as

tea, cotton and bananas. These developments in spraying have often been improvisations, made with such materials and equipment as could readily be procured, and it seems reasonable to assume that they provide scope for improvement.

Such improvements might come both in materials and methods. Of the new materials, the fungicides evolved in the United States of America form at present a very large sector of the field. If I may make another broad generalization, it is that many of them have been developed for use in hot summers having a low humidity and brief rainfall periods. In such an environment the importance of insect pests outweighs that of fungi and the fungicides frequently take the role of supplements added to a long succession of insecticide sprays. The summer climate of much of the United States is paralleled in Australia, South Africa and South and Central Europe, and there a similar outlook on the use of fungicides—for example on fruit—is probably justifiable.

On the Atlantic seaboard of Europe and in those parts of the Colonial Empire where humidity is high and rainfall persistent the requirements for fungicides are likely to be more exacting. I may put it that fungicides for use in such regions need the qualities traditionally associated with this country—stability and tenacity. Where fungicide treatment can be applied in a few lasting spray applications there is a minimizing of cost, which would be particularly advantageous in attempting a first introduction of fungicides into peasant agriculture.

Many of the obvious problems in the control of plant diseases in the tropics are, however, less concerned with choice of fungicide than with securing improvements in application and retention. In the spraying of bananas, for instance, much work is needed on the problem of wetting the foliage; in controlling blister blight on tea the necessity for a high degree of rain resistance in the spray deposit is paramount.

In dealing with these and like problems there are obvious benefits to be gained by fostering co-operation between the plant pathologists in the Colonial Empire and the fungicide workers in Britain. There are already well-established links between the home and overseas staffs of the industrial organizations concerned with pest and disease control. The Commonwealth Mycological Institute has recently made a valuable contribution by supporting the appointment of two plant pathologists to study fungicide spraying of cacao and other crops in Nigeria. Again, the Imperial College Field Station maintains numerous connections with workers in the Colonial Empire. Further links are still needed, and, in particular the provision of bench space in the research stations for plant pathologists on study leave to give them the opportunity to work on their problems of spray application side by side with those having allied interests in this country.

One problem in fungicides to which I have already referred has been almost entirely neglected, namely, spray damage. The lack of understanding of the reasons for phytotoxicity, both on temperate and tropical crops, constitutes one of the major impediments to the development of the use of fungicides. This is an example of a problem that will not be solved except by fundamental studies.

Similarly, logical attacks on problems of the mechanism of fungicidal action, of the effect of spray distribution and retention, and of systemic fungicidal effects can only come from basic research, for which the world depends largely on the countries of Western Europe and the United States. Progress in biochemical and physiological studies both of fungi and of their hosts tends at present to lag behind the more empirical investigations being made in the field. The provision of additional facilities for fungicide studies in this country would be of major assistance in providing a broader foundation for the improvement of fungicides and their application in all parts of the world.

REFERENCES

1. Wallace, T. and Marsh, R. W. (edit.) (1953). *Science and Fruit*. Univ. of Bristol.
2. Large, E. C. and Taylor, G. G. (1953). *Plant Pathology*, **2**, 93.
3. Martin, J. T. (1953). *Nature, Lond.*, **172**, 313.
4. Morgan, N. G. (1953). *Ann. Rep. Long Ashton Res. Sta. 1952*, 94.
5. Moore, M. H. (1953). *Ann. Rep. E. Malling Res. Sta. 1952*, 132.
6. Kearns, H. G. H., Marsh, R. W. and Morgan, N. G. (1953). *Ann. Rep. Long Ashton Res. Sta. 1952*, 90.
7. Crowdy, S. H. (1952). *Emp. J. Exp. Agric.*, **20**, 187.
8. Weed, R. M., McCallan, S. E. A. and Miller, L. P. (1953). *Contr. Boyce-Thompson Inst.*, **17**, 299.
9. Pramer, D. (1953). *Ann. appl. Biol.*, **40**, 617.
10. Cronshey, J. F. H. (1952). *Rep. Internat. Conf. Fernhurst 1951*, 57.
11. Byrde, R. J. W. (1952). *J. Hort. Sci.*, **27**, 192.
12. Owens, R. G. (1953). *Contr. Boyce-Thompson Inst.*, **17**, 221.
13. Sijpesteijn, A. K. and van der Kerk, G. J. M. (1952). *Ant. van Leeuwenhoek*, **18**, 83.
14. Byrde, R. J. W. and Woodcock, D. (1953). *Ann. Appl. Biol.*, **40**, 675.
15. Miller, L. P., McCallan, S. E. A. and Weed, R. M. (1953). *Contr. Boyce-Thompson Inst.*, **17**, 173.
16. Wallace, T. and Martin, J. T. (1954). *Insecticides and Colonial Agricultural Development*. London: Butterworths.

DISCUSSION

THE CHAIRMAN: I am sure you will agree with me that we have listened to a masterly account of a very complicated subject. I think you would like with me to express gratitude to our lecturer for not having *read* his lecture. With a lecture such as this, it is extremely difficult to keep your mind just on what you are trying to say. Mr. Marsh has done it admirably and without the aid of notes.

I think it is obvious that we have been listening to a lecture by a mycologist as well as a botanist. Sometimes these are regarded as being more or less the same thing, but personally I do not think fungi have anything to do with plants; however I do not think that is the point. What you constantly have to face is the problem of how to affect the fungus without damaging the host plant, that is to say, how to get rid of T.B. in an old lady without putting her into an autoclave!

Listening to the lecture, I was very impressed by the fact that in some of the later work the names of the chemicals had a certain similarity with those discovered by Professor Raistrick and his school in investigating the metabolic products of moulds. I do not know whether that would be a subject worth considering; these moulds produce certain substances, and the efficient fungicides seem to me, as a non-chemist, to be in the same sort of group. Also, I think the lecturer rather underlined a remark I made at the start: there is a certain substance in his paper which has forty letters; he called it 'captan'.

MR. J. F. H. CRONSHEY: With regard to our data on potatoes, which Mr. Marsh was kind enough to refer to, it is my impression that whereas the organic fungicides are not, probably, of any use against potato blight, they might be more interesting against the same disease on tomatoes, where the fruit that is going to be eaten is above the ground, comes into direct contact with the fungicide, and is very often damaged by such fungicides as Bordeaux mixture.

The question that I want to ask is this: it has, I think, become rather widely accepted, and Mr. Marsh said this afternoon, that the organic fungicides are more specific than the older ones; does Mr. Marsh really think that that is the case? When we only had Bordeaux mixture and lime sulphur we had to use them (in very odd ways if necessary) for everything. We only had those to use, and so we found a way of using them. However, when the organic fungicides came in they had, as more expensive materials, to compete in price with the older ones. When we say they are more specific I believe we really mean that they are only better than the old materials for certain purposes. In my experience, if you care to put up the concentration or to handle them differently most of the organic fungicides will control a very wide range of diseases. I wonder whether Mr. Marsh would agree on that point?

THE LECTURER: This is rather a tough question. I am sure you will agree that one can only generalize at this stage, and whereas, we have about a hundred years of experience of the older materials, we have a very limited experience of the new ones. However, I do feel that we have materials now which we can use, for instance, against apple scab but not against potato blight, whereas the old Bordeaux, although it was not, perhaps, all that could be desired, did have, I should say, a wider spectrum of activity.

MR. J. C. HARPER: I wonder if Mr. Marsh would say whether there is any evidence of benefit to the host plant from the use of manganese and zinc fungicides in the absence of fungal attack? It seems possible that the manganese or zinc applied in the fungicide might remedy blight micro-nutrient deficiencies. Under these circumstances the effects of applying micro-nutrients in fungicides might not only be to kill the pathogen, but also to increase the powers of resistance of the host.

THE LECTURER: Certainly where such deficiencies exist there is, I think, little doubt that the fungicides can supply them. There have been many examples in the United States of the use of zinc and manganese fungicides which have given increased yields on potatoes in the absence of blight.

MR. A. R. N. ROBERTS: I wonder whether I might claim the privilege of expressing on behalf of us all our warmest thanks to Dr. Ramsbottom for presiding. This has been a really notable occasion in the history of the Fernhurst Lecture. It is evidenced by the distinguished audience we have to-day, which includes, if I may mention two names, Sir James Scott Watson and Sir Harold Tempany, who will be known to you all as respectively Home and Colonial high priests of agricultural science. I am sure that the chairman will rejoice equally in the number of young and eager faces amongst us, which shows that the tradition of that science is not flagging in this country.

Although I am a member of the Council of the Society it is very rarely that I am allowed to speak at it, because everybody knows that I have no real qualification to be on the committee of a learned society. Therefore, when I had to think of a word of thanks to Dr. Ramsbottom I fortified myself by looking at the introduction to his work on *Mushrooms and Toadstools*, which was contributed by the general editor of the series, *The New Naturalist*, Dr. Dudley Stamp, who is a *real* member of the Council of this Society. In that foreword Dr. Stamp says that no one is better qualified to write a book on British fungi than Dr. Ramsbottom. He goes on to speak of Dr. Ramsbottom's forty years of work in the botany department of the British Museum, and the series of displays of fungi which he arranged and which delighted audiences at the Royal Horticultural Society. I am sure that we too should like to endorse all that Dr. Stamp has said in that connection.

Mr. Marsh began with a very happy paraphrase from Keats. During his lecture, to which, of course, I gave 99 per cent of my attention, I am sorry to say I was only able to think of one direct reference to fungi in Keats, and that I will now quote: 'I cannot see what flowers are at my feet, Nor what soft incense hangs upon the boughs'. The last few words are obviously a reference to bark-borne fungi. When I look at the delightful illustrations of Dr. Ramsbottom's book—which are worthy of the text, and that is saying something—I think Keats may also have had in mind the beauties of fungi when he spoke about the flowers at his feet. In connection with the illustrations, I would like to ask Dr. Ramsbottom, when in a later edition he includes the portrait of Mr. Marsh which was taken at the beginning of the lecture, not to put it between the common puff-ball and the giant puff-ball!

I am sure that Fernhurst itself would like to thank the Chairman for presiding. Mr. Stotter, its resident director, and Dr. Holmes, its technical head, are both here. If you can visit Fernhurst, one of them will slay the fatted calf and the other will lay the red carpet down for the king of fungi to come in.

The vote of thanks to the Chairman was carried with acclamation.

THE CHAIRMAN: Thank you very much; that was rather unexpected. I should like to say that the gentleman who did most of the colour photographs is sitting here, Mr. Paul de Laszlo.

Of course, the main thing about the Fernhurst Lecture has been the Fernhurst Lecture, and I am sure you would like to express your very hearty thanks to Mr. Marsh for this most excellent lecture and the manner in which he delivered it. It is one which I am sure we will all enjoy with our pipes and beer, and with the reflection of this rather pictorial room with its many historical associations, and this very pleasant company.

The vote of thanks to the Lecturer was carried with acclamation, and the meeting then ended.

THE EXPERIMENT OF A STATE MEDICAL SERVICE IN NEW ZEALAND

A paper by

SIR ARTHUR PORRITT, K.C.M.G., C.B.E., M.A., F.R.C.S.,

read to the Commonwealth Section of the Society on Tuesday, 30th March, 1954, with The Right Honble Lord Horder, G.C.V.O., M.D., F.R.C.P., a Vice-President of the Society, in the Chair

THE CHAIRMAN: When Sir Selwyn Selwyn-Clarke asked me if I would chair this evening's lecture, there could only be one reply. (This as you know is a very familiar opening!) For more than one reason, I said yes. Sir Selwyn, Chairman of the Commonwealth Committee of the Royal Society of Arts, is a very old friend of mine. He had the audacity to tell a mutual friend just now, who was of the other sex, how long he had known me, which I thought was not a very good recompense for my doing what he wished this evening The second reason is that I have the honour to be a Vice-President of the Royal Society of Arts. The third reason is that I have been to New Zealand, and the fourth reason is that Sir Arthur Porritt is a very old friend of mine and a very esteemed colleague.

You will remember that the immortal Virgil started his epic, 'Arms, and the man I sing'. Arms, that is, the topic: I do not propose to say much about that, I have said a good deal about this topic and some of my comments have not been entirely laudatory. I am, of course, very interested, as who is not? A week ago Sir Earle Page, the Minister of Health for the Commonwealth of Australia, was good enough to send me a copy of his Bill, which received its second reading a few weeks ago, and also what usually simplifies the legalistic terminology of most bills, the white paper, the 'common or garden' way of saying what it is the ministry is trying to do.

Sir Earle Page makes those comments which we have all made from time immemorial about the importance of the health of the citizen. I will not belittle Sir Earle Page by saying that the first three pages of the white paper are full of clichés which go back to Disraeli—that the health of the citizen is the greatest asset of any nation, and so on and so on. We get that repeated again and again, and is it not true? Then we are introduced to the framework of the National Health Bill in Australia. I understand that Sir Arthur will be telling us briefly in what respects the effort being made in New Zealand differs from the effort which is now before Parliament in the Commonwealth of Australia. Sir Earle goes on to stress the importance of the contributions, not only in money, but in interest and responsibility made by the citizens. That is a concept that some of us have been trying to din into the heads of the administrators for a long time. When it is remembered that we have had six Ministers of Health in ten years, and one of them frankly a stop-gap, it does not impress me that the sense of the importance of the citizen's health in the politician's mind is very great. I shall not live to see the National Health lifted out of party politics altogether, because those things take years and I have not many left. I am hopeful that many of you will see this happen. What thrills me about the Australian scheme is that it is no longer a political affair but one of partnership.

Of course it is a function of the State to help the citizen to be fit, help him with medical advice second to none, help him with money if he is down and out, but if he is not down and out it is to help him to help himself. I must inhibit this tendency to say how much I like this Australian scheme and especially for this reason.

And now the man. Sir Arthur Porritt, K.C.M.G., C.B.E., is Surgeon to Her Majesty the Queen, Surgeon to St. Mary's Hospital, Surgeon to the Royal Masonic Hospital, Surgeon either active or in consultative capacity to a number of hospitals, Master of Surgery at Oxford—Otago was his *alma mater* before Oxford—and it goes without saying a Fellow of the College of Surgeons. Sir Arthur is author of a number of works on surgery and, to me more important, a master of surgical technique.

The following paper was then read:

THE PAPER

An experiment is defined as a procedure for testing an hypothesis and adopted on the chance of its succeeding. The hypothesis underlying so-called State Medicine—that the best in medicine should be freely available to all—is based on an unassailable principle, one which, in all fairness, should be credited to the profession itself long before it ever came into prominence as a very valuable plank in a political platform.

Even allowing for this all too evident political bias, which undoubtedly precipitated action that had perhaps been too dilatory on the part of the profession, it would again be only just to assume that all concerned genuinely and honestly hoped for success in the experiment. I therefore stress this experimental aspect as, although the birth of the New Zealand scheme dates back fifteen years and there have been state medical services in Australia and this country for five years or more, these are relatively short periods of time in a country's life to assess the value or otherwise of schemes so all encompassing in their conception.

Perspective is vital; and it is because New Zealand gives us a rather longer view that I have chosen it as the example to compare with others. All the schemes embody ideological principles which none would question; all of them contain and exemplify already glaring defects which should be capable of correction. The tendency to underline the latter comes only from a very real fear that already a generation is growing up—professional, political and public—in which old values are tending to be forgotten; and to those of us who were brought up in those older traditions, however broadminded and up to date may be our present outlook, there is much that any thinking doctor knows we just cannot afford to give up. A profession as old as medicine will not be forcibly revolutionized to anyone's advantage by a few short years of immature political control. The experiment must go on, but it is essential for its ultimate success that the most broadminded co-operation should be developed between those most concerned: the patient, as represented by governmental authority (as it is the state purse which ultimately in part or in whole has to pay), and the doctor. The problem to be solved is at basis the efficient and friendly integration of the age-old traditions of medicine with the economic state of the world to-day.

The solution has not been found yet; it will not be found to-morrow. Like all worthy experiments it will demand much thought, infinite patience, general goodwill and intense work. Given these, and a moral and philosophical outlook sadly lacking at the moment, there would seem to be no cogent reason why in the all encompassing course of time an achievement really worthy of humanity at its best should not ensue.

Let us then look at the early hesitant steps in New Zealand, see what advances have been made in fifteen years and what effects these have produced elsewhere in countries following their example.

First, the environment and background of the experiment. New Zealand, a young Dominion, has always, at any rate since the birth of this century, been health conscious. It is worthy of note that a Ministry of Health has existed there since 1900, whereas in this country the first Minister of Health was not appointed until 1919. The country itself, with a population now of barely two millions, possesses many attributes which should ensure a high standard of health. The climate is temperate, with ample sunshine; there is no overcrowding and there are virtually no slums; the majority of the people live an outdoor life with plenty of fresh air, and they come from a virile stock; the food is ample and good, and facilities for recreation, both mental and physical, are readily available. Hence it is all the more surprising to find that the New Zealand birth rate is only a little higher than in other parts of the Empire; that its sterility and abortion rates are high; that dental caries is rife; that the suicide rate is high; and that it possesses an unenviable number of large mental institutions.

That a very definite health problem existed therefore before the inception of the state service cannot be denied, but it would seem to have been centred rather in preventive medicine than in clinical practice. At this door of preventive medicine most of the faults could be laid, although inside the medical house could be found various organizational defects. There is no doubt that for a proportion of the community—a small one—full medical facilities were hard to come by. Any official backing for research was conspicuous by its absence, and to all intents and purposes still is.

The profession was, however, a happy and efficient one, and the standard of medical education high. In some fields, child welfare and dental services, for example, New Zealand was an acknowledged leader in world medicine. The hospitals then were approximately half state-subsidized and half supported by local authorities. They provided 10·2 beds per 1,000 of population (a world's best) in 1944, but there were still complaints of crowded hospitals and shortage of staff.

Then came the beginning of the State Medical Service, introduced piecemeal and unfortunately without the advice or at first the co-operation of the profession. In chronological order, the following schemes were introduced:

1939. (i) *Free Mental Hospital Treatment.*

(ii) *Hospital Benefits.* Free in-patient hospital treatment came into force, and with it the passing of the honorary medical staffs. Since then all hospital staffs have been at least partly state paid. Figures prove very conclusively

that the demand for hospital treatment has steadily risen since 1939 and in the absence of any payment by patients the drain on the state purse becomes heavier each year. Part-time consultants are employed at figures ranging from £650 to £300. Compulsory retirement is at sixty or after twenty-five years on the staff. There are no pensions. The forty-five government hospitals in New Zealand are well equipped and well staffed. The staffs consist essentially of general practitioners, some with special qualifications. There are still very few specialists as such in New Zealand. Appointments are made by a local board—chiefly lay—and are reviewed every two years. Reappointment is by no means automatic and hence a high standard of service to the hospital is engendered.

The pseudo-specialist on a hospital staff—obviously most inadequately paid at the moment—can augment his income in such private hospitals as remain. These dwindling outposts of private enterprise do in fact receive a government grant of three guineas a week per patient and the latter also receives a grant in aid for medical fees. But maintenance costs, wage increases and price controls, mounting in an atmosphere impregnated with social security, make the future of the private hospital very problematical.

The big hospital problems at the moment are to prevent the tendency of the patient coming to hospital instead of going to his practitioner and to obtain adequate remuneration for hospital specialists. The idea of secret merit awards is anathema in New Zealand. The specialist sees patients without a general practitioner introduction as most of them *are* general practitioners, who, if specializing, can charge a fee of two guineas for the first consultation and one guinea for subsequent visits. At the moment all the patient can claim from state funds is the usual general practitioner allowance of 7*s*. 6*d*., but moves are afoot to increase this in specialist consultation to 30*s*. and 15*s*. There has recently been a slight increase in full time specialists—but even here the pay scale though considerably better than that of the part-time specialist (£1,100 to £1,700) is not sufficient to compare with similar posts in this country or Australia, and hence New Zealand has great difficulty in attracting the best men.

(iii) *Maternity Benefits*. Free maternity services were introduced at a second attempt, the profession's opposition rendering the first abortive. Practically all confinements are carried out in a hospital, be it public or private, the state paying £2 5*s*. for the day of delivery and 12*s*. 6*d*. for all further days up to fourteen. If the aid of a specialist is obtained he can himself charge further fees providing his name is on a list of registered obstetricians kept by the Department of Health. A complicated labour also allows higher fees. It is of interest to note that the six guinea statutory fee is made up of two guineas for ante-natal care (which must consist of a minimum of five visits) three guineas for the delivery (at which the practitioner's presence is essential) and one guinea for post-natal care (at least one visit being required).

The obstetric service has probably turned out better than any other part of the scheme. It has proved efficient, easy to administer and not open to abuse.

1940. *General Practitioner Service*. A contract capitation scheme became available which allowed the patient to sign a contract with the doctor of his

choice, by which the patient received general medical benefits and the doctor 15*s.* per head (plus certain mileage costs) from the Social Security Fund. This scheme, although still extant, proved equally unpopular with doctor and patient alike. In 1941 general medical services were made available on a 'fee-for-service' basis, this fee at first being 5*s.*, raised very soon afterwards in response to the demands of the profession to 7*s.* 6*d.*

The 'fee-for-service' system has proved the most popular method of collecting fees with the profession. The patient signs the doctor's claim form for 7*s.* 6*d.* per act (i.e. consultation, certificate, visit) and these claims are forwarded *en bloc* to the Department of Health. This system, were it not for income tax, has been described as 'celestial', but it is obviously open to abuse as theoretically it puts no limit on the number of patients a doctor can see a day. It proved in its early stages such an open invitation to over-visiting and over-treatment, all cases likely to be time-consuming being sent to swell the already congested hospital departments, that steps had to be taken to deal with irregularities.

The profession itself has now set up disciplinary committees—both local and, to deal with flagrant cases, national—but it is, not surprisingly, difficult to obtain members for these committees, which ask a medical man to sit in judgment on his colleagues' professional activities. The results, though equivocal, have eradicated the practitioner who claims eighty visits a day, and incomes of over £5,000 a year are now few and far between and are regarded with suspicion. This would seem to be a really sad state of affairs all round and in effect the disciplinary committees do nothing but whitewash a faulty system.

It is perhaps worthy of note in connection with the general practitioner service that night calls or week-end visits are entitled to a claim of 12*s.* 6*d.* Even so, it is not easy to obtain the services of a doctor over the week-end. Partnerships are uncommon in New Zealand, but a rota system to cover week-ends is worked by groups of doctors in many places by mutual agreement.

Yet another system of fee collecting, the Refund Scheme, by which the practitioner charges the patient his usual fee and provides him with a certificate allowing *him* to reclaim 7*s.* 6*d.* of that fee, has the blessing of the local branch of the B.M.A. in that it maintains in full the now much discussed doctor-patient relationship, but it has proved difficult to administer and is unpopular with both parties. It is thought that to-day 90 per cent of practitioners are employing the 'fee-for-service' method.

One other recent trend must be taken into consideration and that is the very marked increase in the number of doctors practising in New Zealand. In 1945 there were 800, last year 2,200. The one local medical school in Dunedin produces some 80 to 100 a year, and for the last five years an average of 60 a year have been imported from abroad. For the size of population saturation has now been reached, and the temptations of well subsidized practice may soon be less. There are now numerous applicants, a large proportion with higher qualifications, for advertised hospital posts. Such dilution of work cannot lead to improved standards. It is estimated that relative to population there are three surgeons in New Zealand for every two in this country.

1941. (i) *Free Out-Patient Service* at hospitals was instituted, this being subsidized from state funds to the extent of 60 per cent, the remainder coming from local rates.

(ii) *Pharmaceutical Benefits*, together with a 'New Zealand Formulary' were introduced and have proved the greatest drain of all on the State purse. The bill has increased from a quarter of a million pounds at the inception of the service to three million pounds last year. Apart from the actual cost of drugs, many of which are undoubtedly ordered unnecessarily or largely wasted, a large staff is employed in the Department of Health to check the so-called 'free' prescriptions.

In this sphere too discipliniary committees have had to be set up and it is estimated that as much as 20 per cent of the profession prescribes carelessly or extravagantly. So great is the financial drain in this quarter that it is more than likely a charge will shortly be made for all drugs (except essential life-saving substances) as had also to be done in this country. It is intended also to insist on an extended use of the National Formulary and to increase payment on all proprietary drugs which have a B.P. equivalent. At present many of this group are on the 'free list' as are the hormones and antibiotics.

(iii) *Radiological Services*, both diagnostic and therapeutic are free in public hospitals, and in private practice about 50 per cent of an agreed schedule of fees is met from public moneys. This service now costs well over £120,000 a year.

1942. *Physiotherapy Services* were made available on a similar basis. Practically every physiotherapist in the country belongs to the scheme and can charge a maximum of 7*s*. per service, half of which is recoverable from the State. This produces an annual bill of approximately £50,000.

1944. *District Nursing Services*. These, despite their cost of some £75,000 a year, have proved a success. They are genuinely helpful to the patient and to a considerable extent relieve the pressure on hospital services.

1946. *Laboratory Services*, which are free in both public and private hospitals.

1949. *Dental Services* for school children from the ages of 10 to 16 on a 'fee-for-service' basis. This work is largely carried out by unqualified technicians (nurses) but the scheme has the blessing of the New Zealand Dental Association. It has in fact been in existence in a modified form since 1919.

Since 1949 the Health Service has added to its responsibilities the provision of domestic assistance, of free appliances, of free milk in schools (it is said that New Zealand now breeds no local light-weight jockeys!) of health camps, inoculation services, various official medical examinations and health education.

Such very briefly is the coverage given by the scheme in New Zealand. From odd figures quoted already it will be appreciated that the cost of these services is relatively enormous, far more than was ever foreseen in the original estimates. It is a necessary corollary of all state schemes that consideration of finance bulks largely in any assessment of its merits or demerits. To my mind this is also a very sad fact and it is certainly not only in New Zealand that commercial

concern has insidiously permeated into the sacred and ethical sphere of professional duties. Last year social security as a whole cost New Zealand £57 million, of which sum medical services accounted for more than 20 per cent. Maternity services cost £1 million, general practitioner services £3 million, and pharmaceutical benefits an equal sum; hospital services cost the State £2 million, to say nothing of another £1 million which the local authorities had to pay. Mental hospitals cost £2 million and subsidiary services £1 million.

These are colossal figures for a country the size of New Zealand. One tenth of its income is relentlessly earmarked for social security; 1*s.* 6*d.* in every £1 of wages earned (7½ per cent) is docked for medical services. It is amazing how unconscious the average person remains of these depredations. The glorious word 'free'—such a glaring misnomer under the circumstances—appears to dull his most rudimentary financial appreciation. As has been rightly said, the time is rapidly approaching when something drastic will have to be done to these utopian schemes if the security is going to be kept in social security. What does the recipient get for all this vast expenditure—£11 million a year for two million people?

The public has had access to the profession unrestricted by financial considerations. For a small minority this has undoubtedly been a great boon; for the majority it has meant rather more cursory attention than heretofore, and undeniably longer delay in obtaining hospital facilities. That drugs have been freely available would seem to pander chiefly to the professional chronic—those who make a visit to the doctor one of their chief interests in life. Superficially, and in view of the expense involved, the patient would not seem to be getting adequate return for his money. In all fairness he would not, however, seem to be suffering much detriment, except in so far as the national character is being affected. To be on the other side of a 'rush bargain-counter for bottles' or the recipient of 'slot-machine medicine' cannot really be conducive to the right development of national character, from either the physical, mental or moral, aspect. To suggest, however, that the scheme is unpopular with the public would probably be quite untrue. As in industry, any arrangement by which the employee can indulge in unchecked waste and the employer in selfish profiteering is bound to find many adherents. Surely though, it is a right royal and rapid road to bankruptcy—bankruptcy not only of national finance but of national values.

Of the New Zealand doctor it is both easier and more difficult to write. Most of them belong either in fact or in principle to what the late Government dubbed that 'hopelessly conservative trade union', the B.M.A. Most of them continue to practise under a regime which age-old tradition makes them feel is an unnecessary interference with their professional duties in exactly the same way and with exactly the same ethical code as before the days of a state health service. Most of them are relatively prosperous; many have more leisure than heretofore. But this is a generation of doctors with a tradition behind them—not only a New Zealand tradition but a tradition of all the famous medical schools of this country. The deleterious effect will come insidiously as the years pass

and generations of doctors take up practice who know only service by set hours, by multiple certification, by standardized hospitalization. At the moment New Zealand is said to be teaching almost twice as many medical students as she requires, and as has been said she is also importing others. The result, already evident to some degree, will be loss of incentive, the levelling to mediocrity of individual personality, the absence of men who have taken higher degrees and who can be leaders of their profession.

And yet, in all fairness, one must appreciate there are a number of good points about the New Zealand service. The status of the general practitioner is high. He is to all intents and purposes on equality with the specialist and he has full access to hospitals. He still owns his own practice and can sell it if he wishes and either retire or move elsewhere. He can still place his own value on his services and the doctor-patient relationship is maintained, with a state grant-in-aid to the latter. This must be said to compare favourably with the rigid government contract of this country, which carries not only legal penalties but, as has of recent times been only too frequently and painfully proved, legal dangers.

In New Zealand the doctor's employer is still the patient; I wish one could feel the same here! The New Zealand doctor has no 'list'; patients are not even temporarily tied to any one doctor, although this arrangement, of course, has its bad aspect in lack of continuity of treatment by one doctor to one patient. But the fee-for-service system appears now to be exploited to only a very small degree and recent figures show there are on an average only two visits a patient. It is of interest to compare this with the British figures under a capitation scheme of six visits a patient. Again, the profession in New Zealand is singularly and happily united despite the obvious discrepancies in relative emolument between general practitioners and specialists. And as a profession they now exercise very considerable control over the activities of the Health Service, an atonement on the part of the state for complete lack of consultation and co-operation at the inception of the scheme.

It is probably true to say that the New Zealand State Medical Service has now weathered its acute teething troubles, in a period let us remember three times as long as that which as yet applies to our system here. With certain glaring omissions it has probably evolved as good a type of practice as is possible under a state scheme, a non-contributory scheme, in that, put in its simplest terms, it has come to be state-subsidized private practice. It is equally fair to say that the scheme is horribly extravagant, is open to abuse by both patient and doctor, and fails to encourage or to reward any higher standard of proficiency in professional matters. It has still to solve the major problems of hospital control and consultant services; it has still to consider, as we have here, the question of health centres; it has still to do much more in the sphere of research and post-graduate training and education.

It was the pilot service in these vast experiments of nationalization of our beloved profession that have already taken place and are threatening to take place all over the world. For this reason alone it deserved far more attention

than it has apparently ever received. It was, to give it its due, at basis an idealistic conception even if floated under a political ægis, and its successes and its failures, its cost and its organization, all afford invaluable lessons to those who have 'eyes to see'. It has already borne some good fruit and a far greater supply than was expected of dead-sea fruit; it has done definite good to a minority of patients and definite harm to a minority of doctors; it has proved a very costly national adventure. Its very incompleteness seems to point to an early lack of long-term planning and it has surely proved that governments are not good judges of human nature and that, if they must with the best of intentions feel themselves impelled to break into that essentially personal and private relationship of patient and doctor, then it is vital at least to consult and co-operate with the latter.

These are all lessons of immense value to those who follow the pilot, but in the succeeding ships of state it seems so often to happen that a fog descends—be it political, professional and even philosophical—which prevents due advantage being taken of hard-won experience and hard learned lessons. It is a sobering thought that even great bodies like national governments so often behave as children, who will never learn from the experience of their predecessors but must blunder on and learn the hard way from their own individual mistakes.

The moral I am trying to point, one on which we should surely pause to think for a moment, is that practically all this that I have said already about New Zealand took place *before* the inception of the Health Service in this country. That fact speaks for itself, and it is not my intention to discuss in detail our own service in this country. It is only too well known to most of you, be you doctors or laymen. Like the New Zealand service it probably has much good in it, but given that this country is so vastly bigger than New Zealand and that the Health Service was introduced as a complete entity, with almost as little initial consultation with the profession, even so it encompassed more glaring faults, greater errors of policy, infinitely more complicated and clogging organizational machinery and vastly greater financial outlay.

Enough of ourselves for the moment! Let us consider a country which has studied the New Zealand and the British schemes, and would seem to have learned much from them—Australia. My knowledge of the Australian scheme is admittedly second hand, but of the highest authenticity. Thanks to the good offices of our chairman I was able last year to meet personally Sir Earle Page, the Australian Minister of Health, and it is from him direct that the following facts were gleaned. The outstanding feature of the Australian scheme is that it is founded on a basis of voluntary insurance. The Government's principle is essentially that it will help those who are willing to help themselves. To do this the individual must become a financial member of an approved non-profit-making insurance organization. This entails a small weekly contribution, the minimal average being about two shillings. This minimal schedule of benefits provided by any company must at least equal the government scale of subsidies. But it is perfectly open to any individual to increase his premiums and hence obtain additional benefits. It is perhaps worthy of note that tax reductions are obtainable from health insurance premiums.

As the Minister said, 'our aim is to obtain a friendly partnership between the medical profession, the community, the insurance organization and the Government'. And there would seem already to be ample evidence that the scheme is succeeding. Fifty per cent of Australia's population of eight and a half million are in the scheme on a voluntary insurance basis and a further 25 per cent are covered in the categories of pensioners, ex-war wounded and the completely indigent. The last class in Australia is a very small one indeed. Why has the scheme in the very short period of less than two years (medical benefits were only introduced last year) been so popular and successful? First and foremost perhaps, because it was planned by and has the approval of the profession in Australia. The Government in no way fixes fees and the doctor-patient relationship is in no way disturbed. Secondly, because it gives the patient a personal incentive and maintains his pride in himself. Even when he qualifies for the state subsidy this is paid through his own insurance company. He has an entirely free choice of his doctor and his hospital, at any time. And, thirdly, because a vast amount of the clogging red-tape of the British and New Zealand systems is entirely done away with and the mercenary matters of financial business are dealt with by business firms, that is, the insurance companies.

The Australian Government set out on their full health service scheme in 1949. They introduced it by planned steps with the full co-operation and active advice of the profession, which still exercises a considerable control over its activities. The Minister himself is a qualified man.

The scheme included two major sections. The first is now completed by the medical benefits scheme already mentioned. Previous to this, hospital benefits, again on a state-subsidized voluntary insurance basis, were started in 1951. The minimum premium is two guineas a year (just a few pence a week) which entitles the policy holder to 4s. per day whilst in hospital. This sum the State doubles, giving the hospital a minimum four guineas a week a patient. This continuous stream of revenue has already put the hospitals into an entirely different position to that in which they were—and ours still are—a few years previously.

The fact that most Australian hospitals are now out of the red envisages the second great part of the total scheme: the provision of large capital sums to enable hospitals and health authorities to develop to the full efficient and modern facilities, both in buildings and in equipment. It is certainly of importance to note that the insurance plus government subsidy scheme applies equally to public and to private hospitals.

As well as providing help towards medical and hospital treatment the Government in the first part of its overall scheme has introduced pharmaceutical benefits, a list of drugs prepared by a medical advisory committee being free to all (paid for from state funds by general taxation); a free milk scheme in all schools (private and public) to the extent of one third of a pint per day to all children up to the age of 13 (at present involving some 600,000 children); a special medical service for pensioners (of whom there are just over half a million), by which they are entitled to free medical services, extra drugs beyond the

statutory list and a subsidy of 12*s*. per day whilst in hospital; allowances towards the care of mental patients, and a particularly carefully thought out service for the prevention and cure of tuberculosis. So great a scourge has this disease been in Australia (and for that matter in New Zealand) that it is accepted as a state responsibiliy and the cost of measures to deal with it is met entirely from government funds. It is said to be the most generous in the world. Every individual in Australia over the age of 14 must have a compulsory X-ray. If a man is off work or out of work because of tuberculosis, he receives £5 10*s*. a week if single, £9 a week if married and 10*s*. extra a week for every dependent child. If in a sanatorium he also receives an extra £3 7*s*. 6*d*. a week towards his hospital costs.

And, talking of costs, what does all this cost the country? Last year approximately £25 million—but in future years with the development of hospital and medical services probably about £40 million. In comparison to the other two schemes we have already considered this does not seem excessive. It is undoubtedly expensive, but probably not extravagant.

Please do not think I am putting forward the Australian scheme as ideal. It has certainly not been in existence long enough to show up its faults. But be they what they may, it seems to have a number of good points conspicuous by their absence elsewhere. It has the local profession's backing, it is preventive as well as therapeutic, it stimulates the individual to help himself (and the more the better) and it is economically sound, at any rate to the extent of allowing its medical institutions to build up capital and so plan for major development.

Before I try to summarize in my own mind (if perhaps not in yours) where all these masses of rather dry facts lead us—try to draw a moral from all that has happened to us as a profession over the last decade, try to discover whether the experiments have proved of any lasting worth—may I just briefly mention a few facts about another part of the Commonwealth, not so often considered when discussing national health services, South Africa.

An excellent summary recently published, and written by Professor L. S. P. Davidson, shows that here too there is a considerable degree of nationalization, at least of medical institutions if not directly of the profession itself. Whilst the State Government of South Africa accepts responsibility for the costs and treatment of tuberculosis, leprosy and venereal disease, and also provides whole time medical staff for the health centres of the native reserves, the provincial government provides and maintains and staffs the hospitals. Costs are met partly by the national and partly by provincial governments. In the larger centres there are separate hospitals for African patients with a full-time staff (paid at the rate of approximately £2,000 to £2,500 a year); but in most towns the hospitals house both Europeans and Africans—the latter being in separate blocks or at least separate wards. In these hospitals the European patient pays fees according to his means, the African is considered indigent and receives free treatment. The staff receive no fees from any patient, but are remunerated on a part-time sessional basis and have the right of private practice outside these duties.

Again one sees the trend of artificial divisions of both patients and practitioners into stereotyped categories. It is this regimentation which is inherent in any nationalization project that is taking the soul out of our profession. The spirit, the sense of service is seeping away; the vocational element is being engulfed in a morass of political and economic administration that every day gets more unwieldly, more cumbersome, more pitifully slow. As has been so rightly said the administrative machinery of the welfare state tends ever to get more and more strangled by its own red tape; it does not take long to reach the stage where the machine itself is more important than the duty it was set up to perform and when the worker's personal affairs are more important than his work.

But we must face the fact that we live in a world of welfare states, where things (even medicine) are theoretically paid for by all and enjoyed by all. This state of affairs has presumably been forced upon us willy-nilly by the economic cataclysms of two global wars and there would seem little doubt that this socialistic ideology (in which only the most rabid and bigoted could not find something of good) has come to stay for at least an appreciable historic period. The trouble about the last fifty years has been that they have inadvertently incorporated into themselves the experiences—national, social, economic and scientific—of at least five generations. It is not surprising that we see things out of perspective, and perhaps the reason why some of us at least look back a little to a world in which the idea of charity—charity in its real sense of love of one's fellow creatures—was the basis of a social creed; the day when the rich voluntarily helped the poor.

Even the welfare state has not eliminated these two categories. It is just slowly inverting them. Probably we look back too much to the good old days, but I think most of us, medical and lay, must look back not so many years rather wistfully to the time when our great medical institutions collected pennies in the street and found favour with some generous and wealthy individual donor. Then at least we could develop and show initiative, we could always improve existing facilities. But what now after these early years of experimentation in state medical services? Not only is any major capital development of our medical institutions a mere pipe dream, but our very maintenance costs are pruned (and drastically pruned) to meet the needs of an overall state economy. These vastly expensive experiments may yet in due course emphasize that 'the greatest of these is charity'!

However, we have our welfare state here and elsewhere in the Commonwealth. A welfare state demands social security and an integral part of social security is a health service. In a health service there are two people concerned, the patient and the doctor, and these are all the people of that particular state.

What do the experiments of the last five or ten years in New Zealand and elsewhere teach us about these newly initiated systems? At the risk of being labelled a dyed-in-the-blood reactionary I would say—and, of course, now I express for what they are worth, purely personal opinions—that in some of their supplementary activities, for example, tuberculosis services, free milk schemes, care of mental patients and pensioners, they have, at a price,

achieved some advance. But I would venture to say that in the great spheres of medical and hospital services they have achieved virtually nothing, apart from providing a series of sops to political consciences. This I fully realize is a sweeping statement, but after seeing much of many of these new systems and after thinking much about them I find it extremely difficult honestly, and I hope impartially, to give any other answer to the questions, 'Is the average patient any better treated?' and 'Is his doctor a more efficient or more contented doctor?', than 'No!'

Even if this generalization is only partly true it surely behoves us all to think just where we are heading. If there really is little or nothing of value forthcoming from these gigantic and extravagant national schemes it would seem rational and logical that they should be severely modified or stopped. Let us for a few moments consider some simple facts concerning both the patient and the doctor in the new set-up—points which may help to decide whether my opinion is rabid or otherwise.

Can any of you tell me one way in which a patient is better treated either in general practice or in hospital than he was before the inception of the service? Obviously I am not talking of scientific advances in medicine at the moment, but of facilities, personal or institutional, which may have become available to him.

As regards the patient, he is being insidiously mulcted for exactly similar services to those he received previously for very small or no fees. In the process he is losing or has lost his sense of responsibility to himself and his family and his future. In place of this he has got his rights—which give him nothing but trouble. And in this respect one must make passing mention of the recent extraordinary, almost incomprehensible, attitude of surely one of the greatest British institutions, its judiciary, towards the question of the patients' rights. Such an attitude is nothing but another heavy straw laid on the willing but yielding back of a long suffering profession.

No one is defending negligence or carelessness—the profession has its own very good ways of dealing with such—but that it should be inferred in court that a doctor's primary responsibility is to the state rather than to his patient shows not only to what a perilous state our professional and ethical status has already been enforcedly reduced, but also a woeful lack of understanding of human values on the part of the leaders of the legal profession still, one many remark, un-nationalized. And again what does the very rapid trend of the patient to return to a private practice basis portend? Surely not entire satisfaction with his state service! Yet that it is very true is shown by the figures of every provident association in the country. One company alone has increased its subscription income from £74,000 in 1948 to £556,000 in 1953. This one example represents an increase of 75,000 private patients a year and this same association numbers amongst its clients some 600 business firms who have made *en bloc* arrangements for private practice facilities for their employees—surely a striking pointer in the wind.

The tragedy of the return of the patient to private practice is that it is not—to a large extent, cannot be—met by a similar swing on the profession's part.

The general practitioner who, to combat the penal taxation from which we all suffer, must have so many patients on his capitation list, cannot find the extra time to devote to that intimate professional consultation or visit which is the essence of private practice, and which to every doctor worth his salt is worth so much more than gold. And again, the young potential consultant in private practice veers away from the possibility of launching out on his own because it is financially difficult if not impossible, and because he has been brought up in an age where security is a much safer god to worship than adventure. We, the consultants of to-day, are a passing generation and we are not being replaced. Consulting practice twenty years hence, if not before, will have a 'new look'—perhaps, who knows, a look that will be more suited to the patient of that day—but its constituent panel will be men whose life consists of a series of automatic steps up a stereotyped financial ladder until they reach the safe and respectable haven of a pensionable old age. I suppose some may remain as 'maximum part-time', but everything points to the increasing popularity, both with young doctors and with their lords and masters at the Ministry, of whole-time service. Whether this is good or bad only time will tell but looking back on the history of medicine one must view the possibility with grave doubt. The individualism, the incentive, the willingness and ability to accept responsibility, the human understanding, the sense of service and the value of hard won experience, the stimulus of competition and the fine fellowship of one's colleagues, all these will be at a risk—some at risk of extinction.

With the conception of full-time service comes automatically the rule of bureaucracy and the principle of centralization of control. The vast amount of paper that is already required to run our hospitals, which ran equally well if not in many ways better without one sheet of it, is sufficient indication to-day of the inevitable trend, the threat to individual independence, whether the individual be a man or an institution.

To-day our profession, and with all modesty I would suggest there is none better, is scientifically at its zenith. Chemical and biochemical discoveries, the perfection of technique, the development of specialities and the use of the latest physical methods of therapy, even to the extent of the application of the products of atomic fission, have all advanced medicine to a position that would be unrecognizable even to our grandfathers. The very rapidity of this burgeoning forth has been in itself almost a menace. It has insidiously tended to dim the very essence of medicine, its human side. Our powers of practising our profession have widened until the vista is almost limitless; our responsibilities, which are of far more importance than our powers, have remained unchanged and they are quite simple and yet so much greater than those of any other profession or calling—just life and death. It is a fact that modern medical science can now achieve almost anything on and with the human body. But should it? We have reached the stage where scientific brilliance tends almost daily to cross the line of moral philosophy.

And it is because of this very fact that I view the obvious tendency of state medicine to lead its acolytes towards the standardized, the stereotyped, the

impersonal, type of practice with such concern. Never have we more needed to stress the human side of medicine, the individual contact, mental and physical, of patient and doctor, where the former has infinite trust and confidence in the latter and the latter gives unselfishly and freely of his best to the former. These things are intangibles I fear, but they are pearls beyond price, worthy of tireless pursuit and strictest preservation. I just do not feel that the palliative mediocrity of a state service even begins to reach out towards them.

All this, you will rightly say, is high-powered criticism, but if I did not firmly believe they were things which should be said I would not be wasting your or my own time. Can we, however, admitted we are living in times of social security, glean anything from the experiments of our Commonwealth countries which might point to practical means of coping, even temporarily, with the undoubted threats to professional liberty and hence to patients' welfare? The mass of the people in the various countries we have discussed will take many years of persuading that they are not getting the best from state schemes. My own great fear is that by the time they do appreciate the fact that planning a profession is not practical politics, there will be few left to guide them back or on to the levels where good medicine should be practised.

How can we bridge the gap and leave a few stable planks in the bridge which can be used over the years? For many years I have felt, and still do, that if public moneys must be devoted to the betterment of the public health, and this idea as I have already said existed long before the politicians used, and abused, it, then such moneys should be used not in regimenting and restricting an age-old profession, but in providing facilities (in institutions, in research, in equipment) which would enhance its proficiency and efficiency in treating patients.

The conception of a free profession, working in state-subsidized hospitals, laboratories, health-centres, etc. may seem far-fetched to-day, but had it been developed at any rate at a preliminary stage it would I feel at the same time as satisfying a political conscience have produced a happy profession, capable of maintaining both its basic values and its hard-won prestige, and correspondingly a happy and well-treated patient capable of shouldering his own responsibilities and maintaining his individual dignity.

It is probably too much to hope now for such a radical change as is envisaged by this suggestion—unless, of course, economic conditions force some such measures on the governments concerned: that is when expenditure on state health becomes grotesque rather than excessive as it is to-day.

There is surely everything to be said for divorcing the health service from party politics. If broadcasting demands a national non-party corporation so to a vastly greater extent must the health of a people deserve some similar organization. This would save us all, doctor, patient and administrator alike, countless hours wasted over trivial details of organization and it would divert a large part of the present army of administrators, both central and local, to more worthwhile employment than their present one of shovelling mountains of paper from one basket to the next. Such freedom from direct political ægis

would allow consideration of the use of block grants to regional boards and to hospitals, and thereby restore some of the lost individuality and some incentive to the periphery of the present scheme, where the work is actually being done under orders and with every possible veto and restriction. If any of that indefinable spirit of an institution or an organization that is so vital to its efficiency is going to be retained, some degree of decentralization is urgently called for. The University Grants Committee in this country is an excellent example of a similar concept that works—and works well and efficiently.

Similarly the sooner the general practitioner's right to own, buy and sell his practice is restored the sooner will the standard of practice return to its pristine level. At the moment it is harder for a young medical man to obtain entry into general practice than for the proverbial camel to enter the needle's eye. And again the initial promise in this country to support, or at least not to inhibit, private practice could and should be implemented.

Australia and to a lesser extent New Zealand show how schemes of grants-in-aid can be made to work satisfactorily. The present exclusion in this country of the private patient from the supply of drugs given to the state patient (now for a slight consideration!) is to say the least iniquitous partiality, if not frank dishonesty.

Is it too difficult to picture, and, if approved, to work for, a scheme which envisages a Ministry of Health responsible as it should be for health, that is, public health services and preventive measures of various sorts; a national non-party organization responsible for medical and hospital services to the Cabinet only, working out general overall policy and as far as possible under this policy decentralizing and delegating authority to the periphery, stimulating the incentive and sense of responsibility thereof by a system of block grants varied from year to year according to results and permitting good and fair competition of private practice with its own national service?

Another pipe dream? Probably so—but perhaps something to work for directly or indirectly according to our abilities and opportunities.

I hope I have not been too depressing. I have spoken from my heart as I see things with our profession at the moment and let me reiterate these are entirely personal views, although they incorporate ideas from many good friends throughout the Commonwealth who feel, I know, approximately as I do, not by all counts the least of whom is my very good friend who is chairing this meeting for us to-day, the perennially youthful Lord Horder, in whom medicine in its very best sense never had a more doughty, farsighted or courageous supporter.

Reverting in conclusion to the title of this brief address, may I say with all sincerity that I personally shall always owe a great debt and all loyalty to New Zealand, the country of my birth; that this country of ours owes a great debt to New Zealand, not only in two world wars but in many other ways too; and that we should owe and may still owe a debt of gratitude to the New Zealand Health Service for pointing the ways a national medical service may go or should not go.

I can best express my own faith in our beloved profession—and I am sure

you will not accuse me of sacrilege—by saying that I feel to-day it stands in its own Garden of Gethsemane at the very height of its humanitarian success; it is being betrayed by its best friends—in the main inadvertently—both medical and lay. It seems to be more than probable that in ensuing years, to the unthinking cries of the multitude for whom it has done so much, it will be crucified by having its spirit removed from it, and equally too do I fervently believe that it will rise again to even greater heights and glory—for what greater or more glorious task can man have than caring for and preserving the life that God has made.

DISCUSSION

MR. F. N. DOUBLEDAY, F.D.S., M.R.C.S.: As a dental surgeon to Guy's Hospital I should like to ask two questions. In New Zealand they have a dental and an ancillary service; I should like to ask whether the lecturer thinks the distinction between a practitioner and an ancillary is that of judgment, and that if ancillaries undertake professional treatment involving judgment that principle is infringed. Already the threat of introduction of a similar measure in England has resulted in a great falling off of dental students desiring to enter the profession. The second question I should like to put to him is this: does Sir Arthur think that if the introduction of the ancillaries takes place in dental practice it would be possible to prevent its introduction into the medical practice also?

THE LECTURER: That is a difficult question because I do not know a great deal about the New Zealand dental service. I was always amazed by these auxiliaries, who have for many years been the mainstay of practice there. I think they started for the very reason that we appear to be likely to start them here. If I may say so, you have put the cart before the horse! I think that ancillaries are only put in when there are not enough dentists to cope. That is, I think, what happened in New Zealand. The dentists tell me, and I am only speaking from second-hand knowledge, that their ancillaries are not asked to use much judgment, and that they are only allowed to do the simplest tasks. They are trained very carefully to do a stereotyped job. They are still technicians and they are supposed to refer to a dental surgeon for anything that is outside the sphere of their allotted task. I can only tell you that it has worked in New Zealand. I am not quite sure, but I think I am on your side: if it happened in medicine and we had to teach somebody to do an appendicectomy and nothing else, I should be very annoyed.

DR. W. S. C. COPEMAN, O.B.E., F.R.C.P.: There are three private insurance institutions in this country, and I think Sir Arthur actually mentioned one in his address. I understand that their business is increasing enormously as a result of the somewhat unsatisfactory working out of certain aspects of the National Health Service. I am wondering whether Sir Arthur thinks that the further expansion of these private institutions might ultimately even supplant the National Health Service, if they are offering in fact what the population are wanting; it certainly seems to be what a large part of it is wanting.

THE LECTURER: I thought that I had done a fair amount of wishful thinking already, but I think that that is an extremely nice thought. It has a long way to go yet, but I am sure the tendency is there. I gave only one example of these companies, all of whom are expanding very rapidly. Before the State scheme we had an organization called the Hospital Savings Association which was nothing but a provident scheme. It seemed to me it would have coped far better with the person who found difficulty in paying the simplest fees had the categories who were eligible for the Hospital Savings Association been increased or pushed up. It would have been a very simple

way of coping with the problems. I have no doubt that it will become far more important than it has already. There is a rapid tendency for it to do so at the moment. As I said, my fear is there will be insufficient, professionally, to meet it, if we take a long view.

DR. A. E. BLACKBURN: Malingering is such a drain upon finance that I should like to know what is done in New Zealand and Australia to stop it. Nothing is done in this country, at least not at the moment. I should also like to ask Sir Arthur if he has any knowledge of the conditions in America and the likelihood of a nationalized scheme there.

THE LECTURER: Those are two very difficult questions. There are no means that I know of dealing with malingering, either in Australia or New Zealand, apart from the attention of the individual doctor who tries to ensure that his time is not wasted by people who are coming for no purpose.

I would love to talk about America for a long time because I do happen to know something about it. There is a greater fear in the American profession of the institution of a national health service than any fear there has ever been in the world! There is equally well a fully-fledged state service scheme on the shelves in the White House waiting to be implemented, when some political party thinks it is strong enough so to do. That is why the profession in America has become so thoroughly organized. It has sent delegations over here to see the worst and the best, and has really got a fully prepared opposition to any suggestion that there may be of a national service. They are rabid about the thought. I think that goes for the whole profession in America with very few exceptions. You will realize that America is in exact contradiction to New Zealand. There are practically no general practitioners, everyone is a specialist, and, of course, the more you get into that category the more individualism you find. I think that tendency wrong, but inevitable. They are high-powered *prime donne* to a greater extent than we are and consequently their theoretical opposition is far greater. I do not think I should go into any more detail, but that is the overall position.

SIR ALLEN DALEY, M.D., F.R.C.P.: To what extent are the New Zealand Government and local authorities interested in preventive medicine and the spending of money on it? I am thinking of two subdivisions of preventive medicine, first of all the environmental services, good sanitation, pure water, pure food and that sort of thing, and secondly, the personal health services like education on how to bring up children, the school medical services, and so on. It seems to me, from what Sir Arthur told us, that very large sums are being paid for what is primarily curative medicine. Does that mean that so much public money is being spent on curative medicine that little or none is left for preventive? Or do they take the long-term view and go in for preventive medicine as well?

THE LECTURER: I think I can answer that quite definitely. Long before New Zealand even thought of a national health service their Public Health Service was at a very high standard. What has developed since the inception of the National Health Service is the idea of education. An increasing amount is being spent annually on health education in schools. I think they are very conscious of that side of it as well.

THE CHAIRMAN: What interested me in Sir Arthur's lecture was the approach, the philosophic approach if you like, on a wide front. The topic advertised did not really lead us, or it did not really lead me, to expect such a very fine and broad approach to the whole question of the function of the State in respect of the citizen's health. We have had that, and I have been thrilled by it. I am sure on your behalf you would like me to thank Sir Arthur for this illuminating and able address that he has given us, and from which I am sure we have profited very much.

The vote of thanks to the Lecturer was carried with acclamation, and the meeting then ended.

GENERAL NOTES

SOME LONDON EXHIBITIONS

The third floor of the Building Centre in Store Street, off Tottenham Court Road, is not a familiar, nor perhaps a very convenient rendezvous, and an exhibition there by a dozen progressive artist-craftsmen may well have been overlooked. A great many Fellows of this Society, at all events, are interested in their aim to 'step into the arena of machine craft and exploit its particular qualities'. To regular gallery-goers the work of a number of these artists will be familiar: the transparent relief in plastics by Mr. Victor Pasmore, for instance, the slender brass construction of Mr. Robert Adams, and the hanging 'screw mobile' in brass and steel, that revolves at a touch, designed by Mr. Kenneth Martin. But though we are well aware of the theories that inspired them—aware of the Constructivist Movement, developed by Pevsner and Gabo, which rejected the painted canvas entirely and resorted to the materials of the engineer and the architect, aware also that the suspended mobile is intended (in the jargon) to 'activate' the surrounding air, and make us space-conscious in this age of spatial discovery—at the same time such objects have seemed both bleak and incongruous in the atmosphere of an art gallery. They belong, if they belong anywhere, to airy living-rooms, and no one has been more conscious of that than these single-minded artists.

Unfortunately their works in machine techniques and materials have been largely ignored by manufacturers. Denied the co-operation of industrialists and interior decorators, these artists have most often worked in a vacuum, not knowing on what scale to design a mural relief, or just where some plastic construction would be fitted in an interior scheme. Accordingly this exhibition of original prototypes, more or less adaptable to reproduction, was primarily intended to engage the active interest of manufacturers. Technical readers of this *Journal* might decide, for instance, that Mr. Pasmore's relief makes a greater appeal to manufacturers of glass than of transparent plastic, and the question would then arise how far, if at all, the original model would have to be modified. Again Mr. John Ernest's construction in wood, and Mrs. Mary Martin's mural relief intended to be carried out in concrete, both seem to demand colour; and if that were admitted, other technical problems would have to be resolved. Clearly these are matters that should be examined, especially now when blocks of flats are soaring everywhere that give little evidence of any imaginative artistic mind at work on their interior decoration to offset the uniformity, and even the nullity, of their exteriors. It only remains to add that the exhibitors at the Building Centre had the sympathetic guidance of Mr. John Weeks, the architect, who is himself convinced that these artifacts would fit successfully not only into up-to-date functional rooms but even, for example, into unassertive eighteenth century interiors.

It is the French masters who attract one elsewhere at the moment. At the I.C.A.

Gallery in Dover Street has been arranged an absorbing little exhibition of Georges Braque's paintings and graphic art, culled from English private collections, and gratefully acknowledged by the veteran artist's gift of a drawing of a bird in flight—not unlike those he painted recently as a decoration on a ceiling in the Louvre—here and reproduced on the catalogue. As is the exasperating habit of the Institute of Contemporary Arts, the collection has been hung without any respect to chronology; so that visitors unacquainted with Braque's development must dodge about the room to discover an early realist painting of 1904, a delightful *fauve* picture of the *Canal St. Martin*, fluent in handling and creamy in texture, painted in the following year, and an unusually fine example of his cubist period, *La Mandore*, in subdued buff tones with touches of olive green, which was lent to the Musée d'Art Moderne in Paris last year. The emphasis of the exhibition, however, as one might expect, is on his decorative still-life paintings of the 'twenties, which the British seem to like especially, and with good reason. The classical harmony of these designs was only realized, of course, after years of patient experiment, and in a *collage* of 1914 one may see the basis of his later still-life painting. These works prompt the reflection that whereas Picasso's art echoes all the discords of a distracted world, Braque seems, in the calm gravity of his painting, to resolve them.

The last word should be given to an historically fascinating exhibition, far too large for comprehensive notice, called 'Paris in the 'Nineties' at the Wildenstein Gallery. Vuillard and Bonnard, that endearing pair who reconciled intimacy with a decorative sense, and Vuillard's brother-in-law, Ker-Xavier Roussel, remembered chiefly for his mythological scenes, are all well seen in this anthology which includes a number of exceptionally brilliant, savage, and incisive works by Toulouse-Lautrec. Students of the *fin de siècle* will no doubt pore over the collection again and again, if only for the sake of the books and documents that have been retrieved with some pictures by almost forgotten members of the Nabi movement.

NEVILE WALLIS

EXHIBITION OF INDUSTRIAL DESIGN

An exhibition entitled 'Designed and Manufactured' will be held in the Exhibition Hall of the L.C.C. Central School of Arts and Crafts from 22nd to 25th June, 1954.

The display will have two themes: an illustrated story of a product through all its stages of design, planning, tooling and manufacture; and the story of students in training for posts as designers in industry. The exhibition will also demonstrate a method by which prospective industrial designers are taught how to create products which are not only good to look at, but which are also efficient and easy to mass-produce.

The exhibition will open at 2.45 p.m. on Tuesday, 22nd June, and will remain open from 10 a.m. to 8.30 p.m. until Friday, 25th June. Admission is free.

THE INCORPORATED INSTITUTE OF BRITISH DECORATORS

The Incorporated Institute of British Decorators has recently extended its name to the Incorporated Institute of British Decorators and Interior Designers. The Syllabus of the Associateship Examinations has also been widened to include a special examination for students of the craft desiring to qualify as interior designers.

ROYAL SANITARY INSTITUTE: PRIZE ESSAYS

Three prize essay competitions are announced by the Royal Sanitary Institute. One of the subjects is concerned with building materials, for which the prize will be £70; the other two are concerned with health visitors, and conservation of heat for which the prizes will be £21 each. The first competition is open to persons resident in the British Isles, the other two are open to all.

The closing date for all three competitions is 31st December, 1954, and full details can be obtained from the Secretary of the Institute, at 90 Buckingham Palace Road, S.W.1.

CORRESPONDENCE

HISTORY OF FLYING

From C. H. GIBBS SMITH, *THE ROYAL AERO CLUB, 119 PICCADILLY, W.1*

In an otherwise just review of my *History of Flying*, Captain J. L. Pritchard makes the extraordinary statement that I 'lapse into words hardly fit for a historian to use. A pilot is said to have "circuited" Britain, and helicopters are "whirly-birds".'

The excellent verb 'to circuit' has been used transitively since 1549 and intransitively since 1611 (*vide The Oxford Dictionary*). As a typical example, take Thomas Gale, who wrote (1669–78) 'The Phœnicians circuited the greatest part of the habitable world'. After using the word 'helicopter' throughout the book, I merely made the remark, 'The future of "Whirly-birds"—as they are picturesquely nicknamed in America—is immense'. If a historian should not use words that have been in the language for over three centuries; and not refer to a picturesque new word as a nickname and put it in inverted commas, what—in the name of Dr. Johnson—is he supposed to do in the circumstances?

OBITUARY

SIR LEWIS FERMOR

We record with regret the death, at the age of 73, of Sir Lewis Leigh Fermor, O.B.E., F.R.S.

Lewis Leigh Fermor was appointed an Assistant Superintendent in the Geological Survey of India at the age of 21, becoming a Superintendent eight years later. In 1932 he was appointed its Director, after acting several times before in that capacity. He retired in 1935.

In 1947 he lectured to the Society on the 'Value of Geological Survey Work in India's Economic Development', and he was elected a Fellow in the following year.

MR. F. M. G. DU-PLAT-TAYLOR

We also record with regret the death, on 22nd May, of Francis Maurice Gustavus Du-Plat-Taylor, at the age of 75.

Mr. Du-Plat-Taylor trained in engineering under A. G. Lyster, and served under the Mersey Docks and Harbour Board and the Port of London Authority. He was responsible for large extensions to the docks at Tilbury in 1912. He practised as a consultant after his retirement in 1924.

He was an author of several books on his subject and lectured to the Society in 1950, the year after he became a Fellow, on 'Coast Protection and the Reclamation of Land from the Sea', for which he received the Society's Silver Medal.

LIBRARY ADDITIONS

EXHIBITIONS

DEPARTMENT OF OVERSEAS TRADE. Guide to the pavilion of the United Kingdom, Australia, New Zealand and the British Colonial Empire; New York World's Fair, 1939. *H.M.S.O.*, [1939]. (Presented through B.N.B.C.)

UNITED STATES. United States New York World's Fair Commission. Report to the Congress of the United States . . . . [*Washington, D.C., The Commission*, 1941?]. (Presented through B.N.B.C.)

REFERENCE WORKS

HOLMSTROM, JOHN EDWIN. Facts, files and action in business and public affairs. Vol. I. *Chapman & Hall*, 1951.

KEELING, GUY WILLIAM, *compiler*. Trusts and foundations: a select guide to organizations and grant-making bodies operating in Great Britain and the Commonwealth . . . . with a foreword by the Rt. Honble. Lord Nathan. *Cambridge, Bowes & Bowes*, 1953.

LEWINE, J. Bibliography of eighteenth century art and illustrated books, being a guide to collectors of illustrated works in English and French of the period . . . . *Sampson Low, Marston & Company*, 1898. (Presented through B.N.B.C.)

FROM THE JOURNAL OF 1854

VOLUME II. *16th June*, 1854

The following advertisement appeared in this issue:

ROYAL PANOPTICON OF SCIENCE AND ART

Leicester square.—Gorgeously decorated SARACENIC HALL, 100 feet in diameter, and 97 feet high; magnificent organ, containing 4004 pipes, the bellows worked by steam-power; splendid fountain, throwing a column of water 97 feet in height; Whitworth's and other machinery in action; Brett's printing electric telegraph, &c.; Prideaux's patent self-closing furnace valve, for preventing smoke and economising fuel; manufacturing processes, including Claussin's petticoat loom; statuary; veiled figures by Monti and Gandolfi; picture gallery; OPTICAL DIORAMA, illustrative of Handel's Serenata of Acis and Galatea, accompanied on the Grand Organ, by M. W. T. Best, Organist of the Institution. Musical Illustration: Demonstrations this week will include experimental Chemistry, Electricity, Pneumatics, the steam-engine, explanation of machinery, &c., &c. The Photographic Gallery of this Establishment is open to the Public free of extra charge. Hours of Exhibition: Morning, 12 to 5; Evening, 7 to 10; Saturdays excepted. Admission, One Shilling; Schools and Children under ten, Half-price. Life Admissions, £10 10*s*. Annual Tickets, Gentlemen, two guineas; Ladies, one and half guineas.

Some Activities of Other Societies and Organizations

MEETINGS

MON. 14 JUNE. Geographical Society, Royal, South Kensington, S.W.7. 5 p.m. Derek J. Price: *Aspects of Medieval Survey.*

TUES. 15 JUNE. British Architects, Royal Institute of, 66 Portland Place, W.1. 6 p.m. *Model Building Byelaws.* (Discussion.)

WED. 16 JUNE. Folk Lore Society, at University College, Gower Street, W.C.1. 7.30 p.m. Miss S. C. Yong: *Malayan folklore from the Chinese angle.*

Meteorological Society, Royal, 49 Cromwell Road, S.W.7. 5.15 p.m. (1) F. H. Bushby and M. K. Hinds: *Computation of tendencies and vertical motion with a two-parameter model of the atmosphere.* (2) F. H. Bushby: *The computation of forecast charts by application of the Sawyer-Bushby two-parameter model.*

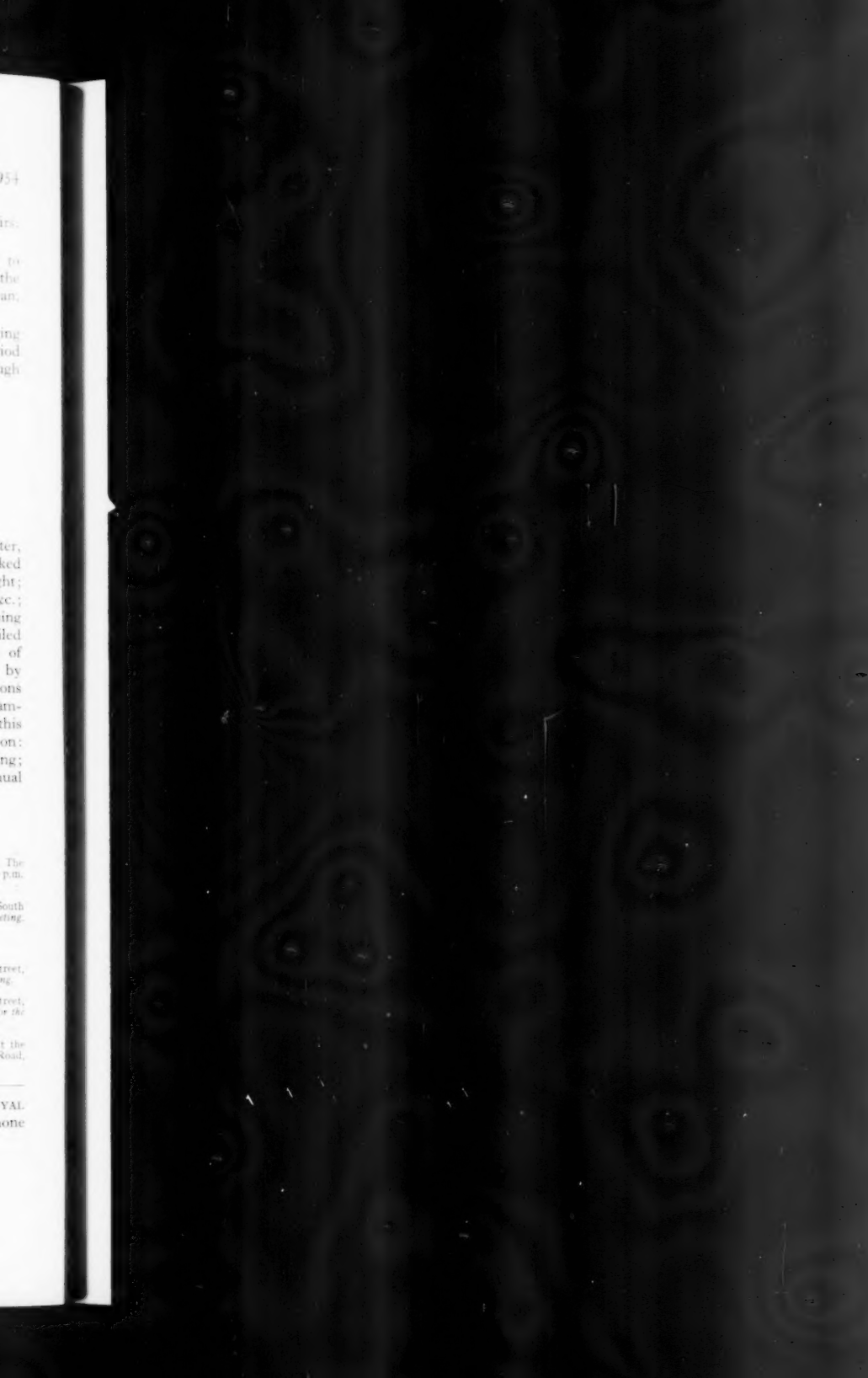
THURS. 17 JUNE. Visual Education, Council for, at The Housing Centre, 13 Suffolk Street, S.W.1. 2.15 p.m. *Annual General Meeting.*

MON. 21 JUNE. Geographical Society, Royal, South Kensington, S.W.7. 3 p.m. *Annual General Meeting.*

OTHER ACTIVITIES

WED. 16 JUNE. The Building Centre, 26 Store Street, W.C.1. 12.45 p.m. Film Show: *Lead for Building.*

WED. 23 JUNE. The Building Centre, 26 Store Street, W.C.1. 12.45 p.m. Film Show: *Power Plant for the Building Industry.*

NOW UNTIL 17 JULY. Sanitary Institute, Royal, at the Museum of Hygiene, 90 Buckingham Palace Road, S.W.1. Exhibition: *Dry Rot and Woodworm.*

Communications for the Society should be addressed to THE SECRETARY, ROYAL SOCIETY OF ARTS, 6–8 JOHN ADAM STREET, ADELPHI, LONDON, W.C.2. Telephone number: Trafalgar 2366. Telegrams: Praxiteles, Rand, London.